

*Five decades after Markowitz outlined the foundations for Modern Portfolio Theory, many individual investors are still not diversified. In fact, ironically, a large majority of the wealthy would not have become so had they followed a diversified approach.*

## Beyond Markowitz

### A Comprehensive Wealth Allocation Framework for Individual Investors

**I**n sharp contrast to the recommendations of Modern Portfolio Theory (MPT), a vast majority of investors are not well diversified. This neglect of diversification is seen across all wealth segments, including the affluent. This paper attempts to provide a solution to this “diversification paradox,” by expanding the Markowitz Framework of diversifying market risk to also include the concepts of Personal Risk and Aspirational Goals.

The Wealth Allocation Framework enables individual investors to construct appropriate portfolios using all their assets, such as their home, mortgage, market investments and human capital. The investor may choose to accept a slightly lower “average rate of return” in exchange for downside protection and upside potential. The resulting portfolios are designed to meet individual investors’ needs and preferences, as well as to protect individuals from Personal, Market and Aspirational risk factors.

The Wealth Allocation Framework attempts to bring together MPT with aspects of Behavioral Finance through a single pragmatic Framework. A major conclusion of this work is that, for the individual investor, Risk Allocation should precede Asset Allocation.

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## 1. DISCREPANCIES BETWEEN THEORY AND REALITY

The principles of Modern Portfolio Theory, as outlined in Markowitz's famous 1952 paper,<sup>1</sup> speak clearly and unambiguously to the benefits of portfolio diversification. There is an optimum way to create a portfolio by combining different asset classes. This construction depends crucially on the market risk and return of each asset class and on the correlations between different asset classes. These optimal portfolios, when mapped on the risk-return plane, form a curve known as the efficient frontier. Each investor, based on his personal utility function, finds the appropriate point on this line, which then prescribes an optimum allocation between different asset classes such as stocks, bonds and cash.

It should be intuitively obvious that, in order to achieve a truly diversified portfolio, one must also diversify within each asset class. For example, equity portfolios should be composed of a large number of minimally correlated stocks; bonds should be diversified across both maturities and credit ratings. According to MPT, diversification minimizes non-systematic risk, and diversification, combined with the use of a utility function, provides the investor with the right balance between risk and reward. The interested reader may refer to Appendix A for details on how the Markowitz Framework is implemented in practice. More ambitious approaches such as Merton's pioneering work<sup>2</sup> on dynamic asset allocation, which incorporates multi-period investor consumption, unfortunately have not found widespread acceptance in the personal finance world.

However, in sharp contrast to these recommendations, a vast majority of investors in the U.S. and in countries around the world are not well diversified. This neglect of diversification is also seen across all client segments, including affluent clients who have access to Private Wealth Advisors, financially sophisticated investors, and participants of employer-sponsored retirement plans.<sup>3,4,5</sup>

What does lack of diversification result in? The dangers of undiversified portfolios have been indelibly etched in the minds of many thousands of investors who participated in the Internet bubble with "irrational exuberance".<sup>6,7</sup> Many of their investments became worthless as their technology-heavy portfolios sustained heavy losses and never recovered.

Yet there is a remarkable group of people, a minority of the general population but a significant majority of the affluent, who have become wealthy over the years by defying market diversification. Ironically, many of them would not have become so wealthy had they followed a conventional diversified approach.

Some examples of such successful "undiversified" strategies have been:

- Investors who assumed a mortgage to invest in single-property real estate and saw the value of their property double in a few years. This has often meant a several-fold return on their down payment, which of course corresponds to a highly leveraged investment. In contrast, investors whose property value decreased saw their down payment vanish.
- Corporate executives who accumulated low-basis stock and stock options and did not diversify, while the value of their company stock and options doubled and redoubled. In contrast, others who used the same strategy saw their company stock fall sharply and their options expire worthless.
- Individuals who invested most of their human and financial capital and started a small business that became successful over time. During this period they continued to reinvest in their business, intensifying their risk, until they finally cashed out in a single buyout transaction. In contrast, nearly 33% of small businesses fail within four years of starting up.<sup>8</sup>

It is important to emphasize that, when we look at the wealthy, we clearly suffer from what we call "survivor bias," i.e., we are only looking at the winners. On the other hand, one cannot dismiss most of the wealthy (numbering 10 million or more in the U.S. alone) as mere winners of "lotteries" or of "excessively risky strategies."

### Three Important Questions

Probing deeper, we seek to understand three issues:

1. Did these "now affluent" individuals take unnecessary, foolhardy, or excessive risks to achieve wealth?

2. When people ignore Modern Portfolio Theory’s advice on diversification, are they behaving irrationally (as MPT would suppose) or is there a fundamental flaw in the theory itself?
3. Is there a Framework that provides an optimum way of assuming risk, while still protecting oneself, in order to achieve or significantly increase affluence? If so, is this Framework consistent with MPT or is it at odds with it?

The aim of this article is to provide answers to the questions posed above. We develop a comprehensive risk allocation Framework by expanding the traditional Markowitz (market risk) Framework to include safety (personal risk) and aspirational components. In section 6, this approach is illustrated through an idealized example using a stock index, a call, and a put. In section 7, we discuss benchmarks and asset classification in the context of risk allocation. Subsequently, in section 8, we analyze a more complex real-world example. Finally, several different aspects of the Framework are discussed in section 9, notably how real estate, stock options, human capital, and annuities naturally fit into this expanded Framework. Appendix C provides an approach to evaluate investor risk preference based on combining both objective and subjective measures.

## 2. A CHANGING REALITY

The three questions stated earlier are not merely academic questions. Changes in the structure of pension plans, life expectancy, and the globalization of financial markets have increasingly thrust upon individuals greater responsibility for their financial future. The ability to invest appropriately to meet their individual requirements will be the single most important determinant of their ability to maintain their current standard of living during their retirement years and of their financial success.

Let us discuss some of the major changes.

1. The movement of corporations from defined benefit plans to defined contribution plans has effectively *transferred the risk of (the future underperformance of) capital markets to the individual*. Individuals now are left with lump sums of liquid assets as opposed

to stable pensions. The well-being of people in their retirement is critically dependent on the correct investment of their assets. Should investors follow the principles of MPT?

2. Increases in average life expectancy require a greater amount of savings in order to maintain a standard of living through retirement. Furthermore, life expectancy is likely to continue to increase during our lifetimes. Defined-benefit pension streams were guaranteed to continue throughout the beneficiary’s lifetime. Defined-contribution lump sums, in contrast, will have to be stretched further through appropriate investment choices made by the beneficiary. What does MPT tell us about how best to allocate an individual’s assets to provide for the extended lifespan?
3. Different financial markets and fund managers now display a greater degree of correlation than what historical data would suggest. This means that portfolios thought to be diversified in the past may not be so today. Does that minimize the benefits of diversification? What effect does that have on risk-return expectations for diversified portfolios?
4. Constant innovation in financial products, as well as enhanced access to more sophisticated financial instruments such as options, hedge funds, and structured products, present compelling, yet more complex risk-reward opportunities to investors. What does MPT tell us about their choice and allocation to an individual’s personal portfolio?

## 3. THE JOURNEY MATTERS: INDIVIDUAL INVESTORS AND MARKETS ON THE AVERAGE

The needs of individual investors impose different considerations than simply the averages of the market.<sup>9</sup> The emphasis of the efficient frontier approach using market risks, without consideration for its effect on the portfolio holder, is fundamentally unsatisfactory. Personal utility functions are hard to determine and have well-documented flaws.<sup>10,11,12</sup>

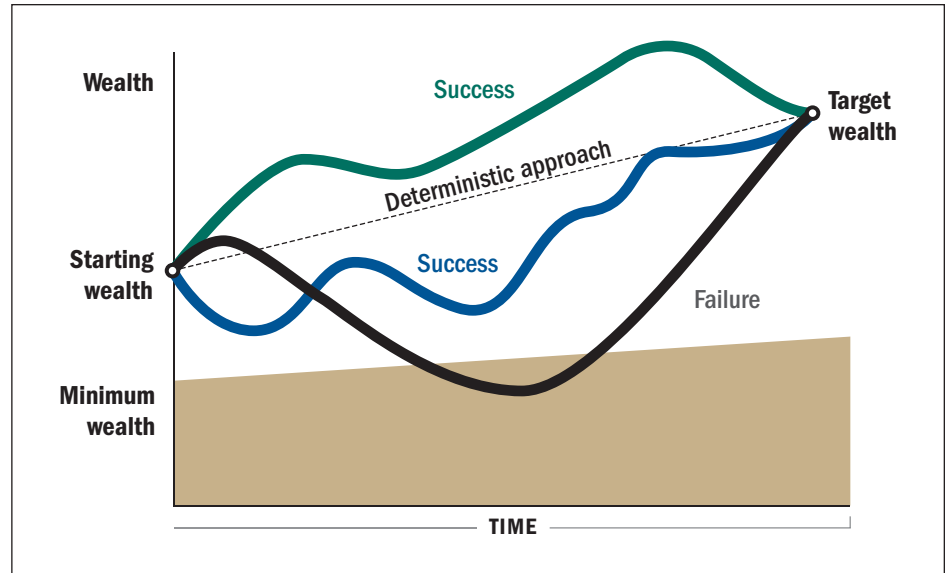
In addition, the efficient frontier approach optimizes for a portfolio’s outcome at the end of a single predetermined time period. There are at least two problems with this.

- Investors need to maintain their lifestyle and meet their financial obligations during this time period regardless of market conditions.
- We do not always know at the outset what the specified time period should be. For example, we need to provide for retirement without knowing exactly how long we will live.

In the standard Framework, risk is defined by the volatility of the underlying portfolio. Volatility is a one-dimensional measure of market risk which tracks how much the price of the portfolio fluctuates, on the average, over a specified period of time. For example, a diversified index consisting of large-cap stocks, such as the S&P 500®, has a daily volatility (standard deviation) of about 1%. Within the confines of the mean-variance Framework, this number indicates that we should expect a daily move greater than 2% only about once a month. A 3% move would happen once every three years, while the market crash of October 19, 1987, when the index fell by 20.47%, should happen only once in a billion years. However, such crashes (of varying magnitude) have happened many times in the past century. Clearly, the mean-variance Framework and the associated volatility number do not capture the true frequency of short-term market crashes.

The same measure viewed over a longer time frame, such as a year, does much better. The historical (1926-2003) annual volatility of the S&P 500 is about 21.9% and the average annual return is about 12.5%. This provides a much better estimate of the movements of the index that an investor can expect over a year. For example, the investor should expect a two standard deviation event or a 31.3% loss on a single portfolio only once every 20 years. This has occurred only twice in the last 75 years and on both occasions in the 1930s, once in 1931 and then, unexpectedly, six years later in 1937. This last observation highlights another important point: the assumption that the market returns have no memory breaks down often, due in part to the impact of economic cycles. These cycles create bull and bear markets that consist of closely spaced or successive years of economic feast or famine.

EXHIBIT 1  
THE JOURNEY MATTERS



The consequences on the individual investor of such large deviations or several consecutive years of negative returns may range from mere annoyance to catastrophe. In other words, the market understands risks only at an aggregate level, not at an individual level.

*Personal risk* is thus an additional dimension that must be factored in to construct appropriate portfolios for individuals. This consideration also makes the problem path-dependent. Clearly the journey matters. All paths in Exhibit 1 lead to success, but the one that dips below the client’s minimum acceptable wealth level is fraught with danger. A stream may have an average depth of five feet, but a traveler wading through it will not make it to the other side if its midpoint is 10-feet deep. Similarly, an overly volatile investing strategy may sink an investor before she gets to reap its anticipated rewards.

It is worthwhile to point out that most extensions of MPT have been directed at improving the description of market risks.<sup>13</sup> The same emphasis has not been placed on understanding the issue of personal risks, although Roy<sup>14</sup> placed particular emphasis on “safety first” within the context of portfolio diversification. Innovations in the marketplace over the past few decades, leading to instruments like options, convertible bonds, and principal protected funds, should allow for the creation of portfolios that are more suitable to different individual risk tolerances.

*What Are Some of the Components of Personal Risk?*

- **Cash flow:** The investor’s current and foreseeable cash flow is at least as important as his/her asset allocation. Is he/she a net-saver or net-spender on an annual basis? Will he/she need to withdraw money at any juncture or on a regular basis? If so, will it be a fixed or variable sum? For example, withdrawing a fixed amount of money every year can have adverse consequences in the context of a declining market.
- **Lifecycle stage:** Someone at the peak of his/her earning capacity may be able to take on more risk than someone approaching retirement. On the other hand, a wealthy person in an advanced stage of retirement seeking to achieve an ambitious legacy goal may want to take on more risk with a portion of the portfolio.
- **Ability to weather shortfalls:** How does one protect against outliving one’s assets, e.g., living 10-15 years longer than life expectancy? What is an effective solution to an eventual decreasing gap between the minimum acceptable wealth level and the individual’s current wealth?
- **Event risk:** The investor needs to understand and protect, if possible, against a variety of singular events such as loss of job, major health problems, disability, the need to support an additional family

member, lawsuits, etc. Macro events, such as market crashes or country defaults due to political or economic reasons, also present real threats to maintaining personal wealth.<sup>15</sup>

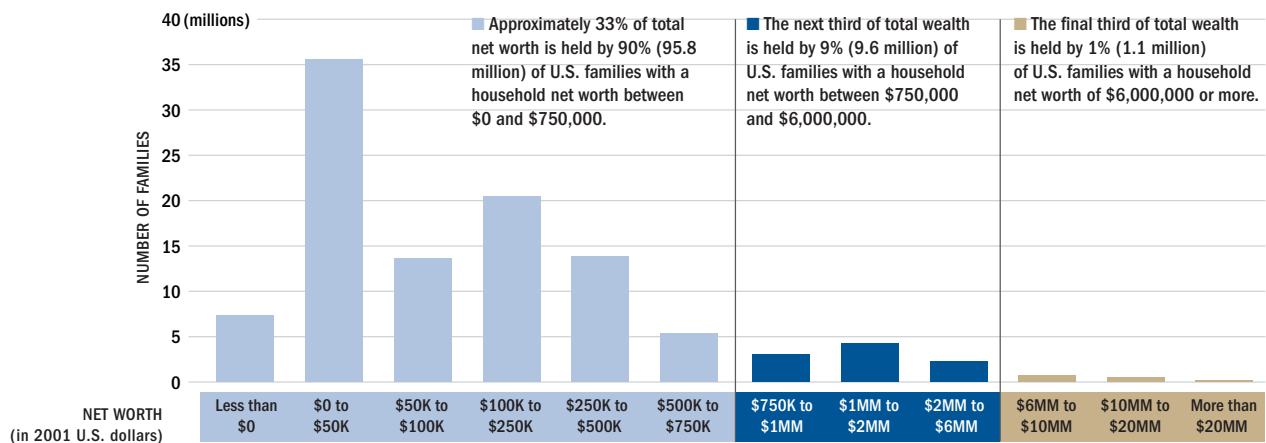
In order to understand how to successfully incorporate these diverse risk factors into an individual’s financial strategy, it is instructive to consider how wealth is measured on both absolute and relative scales.

**4. THE WEALTH OF AMERICA: WHO IS WEALTHY?**

Individual investors consider their success and wealth not just in absolute terms, but also relative to their peers. Therefore, it is instructive to consider the wealth of America and how it is distributed among its population.

This distribution of wealth in America (*Exhibit 2*) is fascinating in many respects. As is well known, wealth is unevenly distributed. If we divide the total wealth of American households into three equal parts, we find that each third is approximately shared among 90%, 9%, and 1% of the households respectively. The shape of the wealth distribution is far from the usual symmetrical bell curve. Starting from the far left of the curve, approximately seven million households are in debt. There are another 33 million households with almost no net worth. A startling fact: one in three American households is a single event away from bankruptcy. An important question is: What should be the financial

**EXHIBIT 2  
THE WEALTH OF AMERICA INCLUDING HOME EQUITY**



Source: Calculation by R. Babu Koneru based on 2001 Survey of Consumer Finances Data (Federal Reserve Board [2003]). Available at <http://www.federalreserve.gov/pubs/oss/oss2/2001/scf2001home.html#rpw2001>.

### EXHIBIT 3 CUMULATIVE DISTRIBUTION OF NET WORTH OF U.S. FAMILIES IN 2001

Wealth Percentile	Net Worth
6.8	<0
10	\$100
20	\$6,760
30	\$22,840
40	\$49,560
50	\$86,100
60	\$138,100
70	\$226,210
80	\$375,100
90	\$734,100
95	\$1,308,520
99	> \$5,865,000

Source: Calculation by R. Babu Koneru based on 2001 Survey of Consumer Finances Data (Federal Reserve Board [2003]). Available at <http://www.federalreserve.gov/pubs/oss/oss2/2001/scf2001home.html#rpw2001>.

strategy for these households? For the other two-thirds of households, the purpose of a good wealth management strategy is to *protect* them from ever coming close to this region at any stage. On the other side of the wealth spectrum, the far right region of the curve is where everyone aspires to move to. However, the long tail (similar to a lognormal distribution) indicates that it is not so easy to move rightwards. It is useful to introduce the concept of a wealth percentile.

Every American household can find its place on this table (*Exhibit 3*) and thus determine its wealth percentile. There are a total of about 106 million households; therefore each percentile represents about 1.1 million American families. The median wealth of an American household is about \$86,100,<sup>4,15</sup> which corresponds to the 50th wealth percentile. Households in the lowest seven percentiles (0-7th) have a negative net worth, while those in the top percentile (99-100th) have at least \$5 million each.

At the very outset, it should be clear that every household, regardless of its current wealth, should make sure that it:

- does not move leftwards (decrease its wealth percentile);
- at least keeps up with its wealth group;
- aspires to move rightwards (increase its relative wealth standing).

However, the details of this wealth distribution chart indicate that this is a non-trivial task.

In general, you need a lot of money (relative to what you have) in order to increase your wealth percentile. For example, for a household to move from the 40th (slightly below the median) to the 60th percentile (slightly above the median), its net worth would need to triple! This means that, in order to move up in the wealth structure, one must acquire substantially, not incrementally, more wealth. One cannot meet such an aspiration without taking on substantial risk, what we will call “aspirational risk.” On the surface, this risk taking is at odds with the imperative to protect from falling to a lower wealth percentile. It would seem reasonable to assume that most investors in this situation would pass up the opportunity for improvement in favor of the certainty of the status quo. However, it is not so.

Among all wealth levels, aspirational risk taking is quite common. Examples range from the frequent buying of lottery tickets to more mainstream financial investments such as the substantial purchase of a single stock, investment in real estate, or starting a small business. Every time a member of the peer group succeeds in his aspirational risk taking, the difficulty of staying in the peer group is raised for those who passed on the opportunity. It is easy to see how the desire to keep up with the Joneses raises the general level of risk taking, especially among the affluent. This becomes more and more prevalent in higher wealth percentiles. An extreme example is that of maintaining or improving one’s position in the Forbes 400 list. The net worth required to be the 400th richest American increased sixfold (from \$100 million to \$600 million) over the last 20 years.<sup>16</sup> In comparison the Consumer Price Index increased by 90% over the same period.

Even at the lower end of the wealth spectrum, it is impossible to maintain one’s standard of living by keeping assets only in the bank. Inflation requires some degree of investment in bond or equity markets and therefore the assumption of additional risk.

The conventional Framework does not have the flexibility to accommodate the dual demands of safety and aspiration.<sup>17</sup> This issue, which points to the need for non-concave utility functions, was first addressed by Friedman and Savage<sup>18</sup> and was the subject of a paper by Markowitz.<sup>19</sup> However, this area received limited



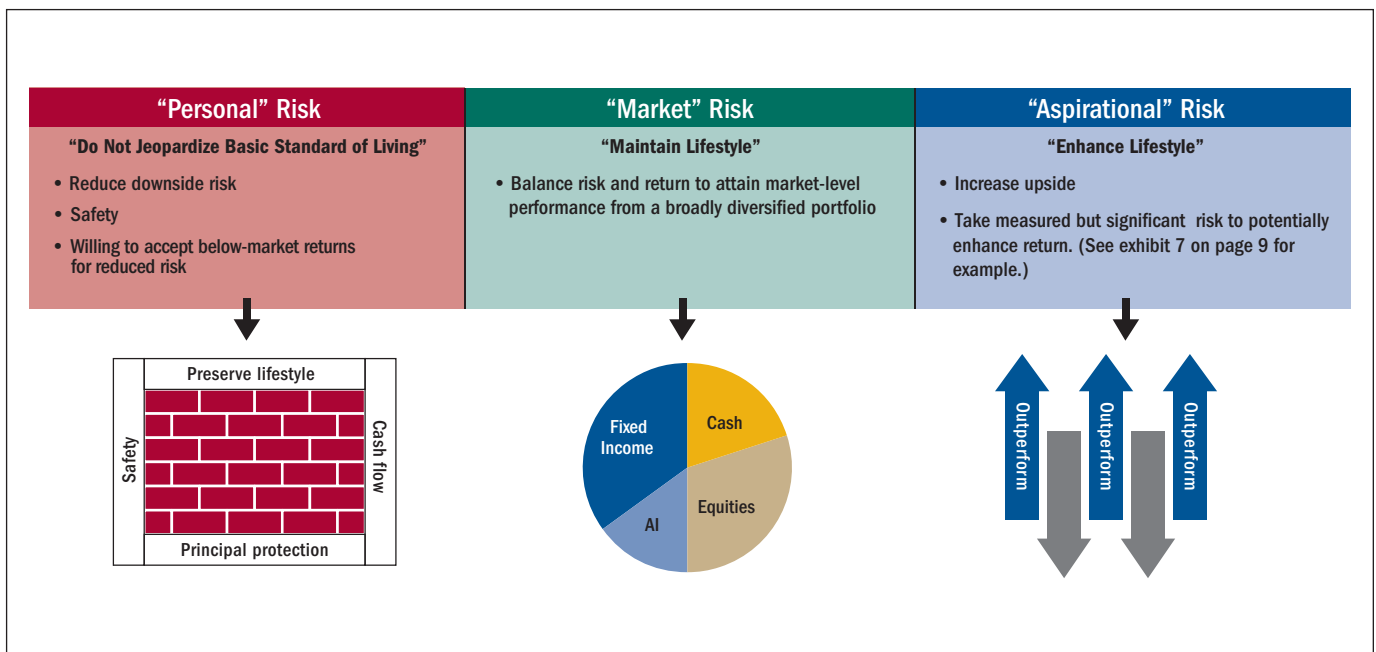
attention, in comparison to the work on portfolio diversification,<sup>1</sup> until Kahneman and Tversky’s work on prospect theory.<sup>11</sup>

In conclusion, we need a new Framework that incorporates these aspects of safety and aspiration, while building upon the foundations of MPT.

- Ability to maintain his standard of living and status in society, i.e., keep up with family and friends. As discussed earlier, in order to do this, investors must earn a rate higher than inflation and thus take on market risk.
- Provide an opportunity to increase his wealth substantially or meet his aspirational goals. This involves taking on some aspirational risk.

In their famous 1979 paper, Kahneman and Tversky<sup>11</sup> laid the groundwork for prospect theory, which attempts to understand and incorporate actual

**EXHIBIT 4  
THREE DIMENSIONS OF RISK**



**5. A WEALTH ALLOCATION FRAMEWORK FOR THE INDIVIDUAL INVESTOR**

To develop a comprehensive wealth strategy, we will expand the definition of portfolio to cover all assets and liabilities such as investments, home, mortgage and human capital. Human capital can be loosely defined as earning potential.

Let us re-emphasize that a person’s portfolio should allow him to achieve the following three purposes:

- Protection from anxiety/poverty: We will refer to this as protection from personal risk.

investor behavior. They found several important factors that dominate decision-making in the face of risk and return trade-offs, not just in finance, but across a wide variety of human decision-making. By using a series of cleverly formulated questions, they found that certainty, probability and possibility (among others) were important mindsets that dominate decision-making in the face of risk and return trade-offs. For example, they found that people will most often choose lower but certain payoffs, rather than higher payoffs with less than certain probability. This experimentally verified behavior runs counter to standard utility theory. We embrace and incorporate these psychological preferences as a fundamental part of the expanded framework.

We will strive to construct an *ideal portfolio* that provides:

1. The *certainty* of protection from anxiety.
2. The *high probability* of maintaining one's standing.
3. The *possibility* of substantially moving upwards in the wealth spectrum.

### *Three Dimensions of Risk*

The three objectives of an “ideal portfolio” lead naturally to a Framework with three very different dimensions of risk: personal, market, and aspirational.

- *Personal Risk*: You must protect yourself from personal risk. This means protecting yourself from anxiety regarding a dramatic decrease in your lifestyle.<sup>20</sup>
- *Market Risk*: You need to take on market risk,<sup>1,21</sup> in order to grow with your wealth segment and maintain your lifestyle.
- *Aspirational Risk*: You could take on aspirational risk if you desire to break away from your wealth segment and enhance your lifestyle.

Modern Portfolio Theory only recognizes market risk and seeks to minimize it through optimal asset allocation. In contrast, the Wealth Allocation Framework identifies three very different risk dimensions and seeks to optimize all three of them simultaneously. *We call this risk allocation.* In the new Framework, risk allocation needs to precede asset allocation. Exhibit 4 on page 7 illustrates each risk dimension with its corresponding objective and trade-offs.

### *In summary:*

- Allocations to the personal risk bucket will limit loss of wealth, but will yield below-market returns.
- Allocations to the market risk bucket will provide risk-adjusted market returns (this is the Markowitz Framework).
- Allocations to the aspirational risk bucket should yield higher-than-market returns, but with the risk of substantial loss of capital.

In the very simplest case this Wealth Allocation Framework can be reduced to a standard diversified portfolio with downside protection and enhanced upside potential. To illustrate the added capabilities of this Framework, it is instructive to consider one such example in detail.

## 6. AN IDEALIZED EXAMPLE

We will use a simple albeit idealized example to illustrate many of the issues we have discussed so far. Consider an investor with a portfolio of \$100 represented by a “diversified asset” such as a stock index. For the purpose of this discussion, we will simply use the historical record of the S&P 500. We will compare and contrast the risk-return characteristics of such portfolio with those of one constructed using the expanded approach by adding a put option (to protect from loss of capital) and a call option (to deliver additional upside).

For illustration we will assume a two-year time horizon. Historically, a long-term investment in the S&P 500 has been richly rewarded. In the past 79 years (1926-2004) the average two-year total returns on a monthly rolling basis for the S&P 500 has been 26.5% with a volatility of 32.8% (an annualized volatility of 23.2%). In other words, on the average, the investor should expect to have about \$126 at the end of two years.

However, examining the history of the index, we find several two-year periods almost every decade that provided either handsome gains or heavy losses. These time periods of larger than expected market movements are evidence of the deviation from the mean-variance Framework. They also underscore the importance of protecting an investor from such large deviations on the downside and the opportunity of capitalizing on large upside movements.

Our investor, of course, does not know a priori how this investment period will turn out. His goal is to invest aggressively and double or triple his money, but at the same time he would like to cap his losses at about 25%, i.e., not go below approximately \$75.

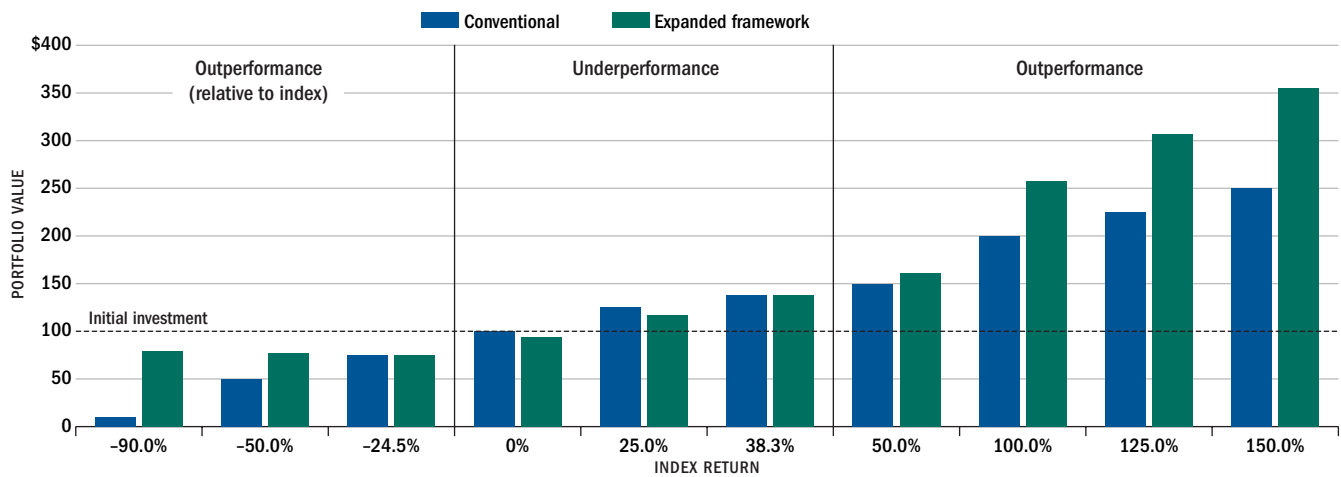
In order to turbocharge this portfolio, the investor buys a call struck at 130. If a bull market takes shape and the index exceeds 130, the investor's gains are doubled for every point above 130. At the same time, as a precaution, he buys a put struck at 80. When the index dips below 80, the put will kick in and prevent further losses to the portfolio.



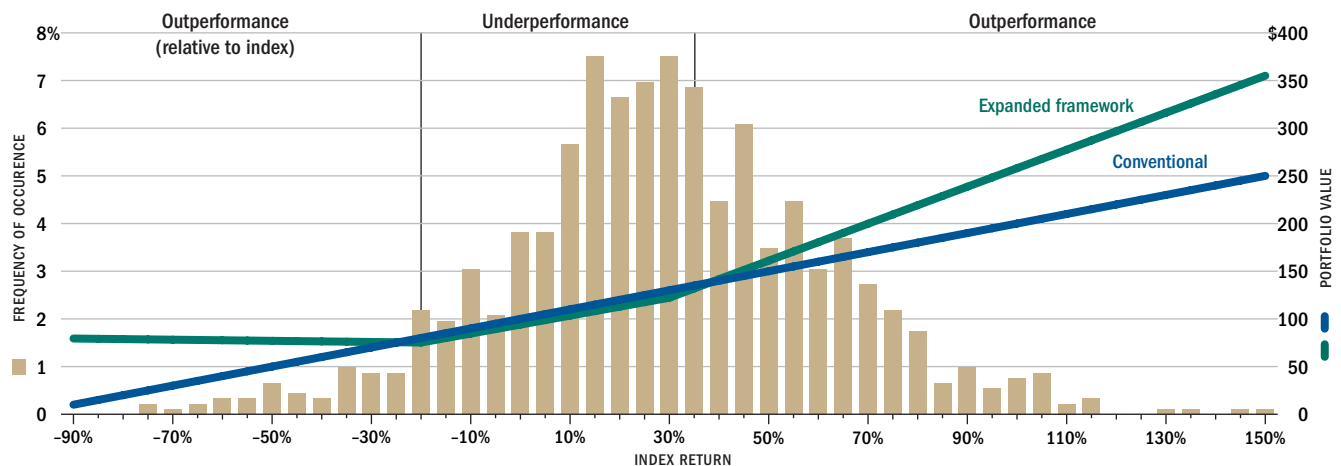
**EXHIBIT 5**  
ASSET ALLOCATION AND SELECTION FOR AN IDEALIZED EXAMPLE

	<b>“Personal” Risk</b> Do Not Jeopardize Basic Standard of Living	<b>“Market” Risk</b> Maintain Lifestyle	<b>“Aspirational” Risk</b> Enhance Lifestyle
<i>Expanded Framework</i>	Put struck at 80%	Index	Call struck at 130%
<i>Conventional Framework</i>	0%	100%	0%
<i>Expanded Framework</i>	1.55%	94.01%	4.44%

**EXHIBIT 6**  
COMPARISON OF PORTFOLIO VALUES



**EXHIBIT 7**  
COMPARISON OF PORTFOLIO VALUES



Of course, both the put and the call cost money, so he has only \$94 left to invest in the index. In the Wealth Allocation Framework, the investor has allocated \$1.55 to the personal risk bucket and \$4.44 to the aspirational risk bucket in order to buy the put and call options, respectively. (For simplicity these numbers have been calculated using the Black-Scholes model. The same example was also analyzed using real-market prices. At the time of analysis the puts were considerably more expensive and the calls cheaper; however, the basic conclusions were unchanged.)

Let us compare how the conventional portfolio and this expanded portfolio (*Exhibit 5, page 9*) would perform under a variety of conditions.

We see clearly (*Exhibit 6, page 9*) that, when two-year market returns are in the range of  $-25$  to  $+25\%$  (which we would expect for a majority of the years), the old framework will outperform. On the other hand, the expanded portfolio protects and outperforms the index in both severe bear and bull markets. The investor has agreed to a slightly lower rate of expected return most of the time, in exchange for both downside protection in severe bear markets and greater upside potential in bull markets. This is the crux of the Wealth Allocation Framework.

For illustrating the trade-offs from this particular strategy, we look at rolling annual returns of the S&P 500 for the past 80 years (*Exhibit 7, page 9*).

The Wealth Allocation Framework provides protection of capital in a massive bear market, higher upside in a strong bull market, but a lower average return during normal years. Paying for protection in the form of purchasing put options and allowing for higher opportunity by buying call options reduces the average return to the investor. This loss, however, is compensated by superior returns at both ends of the investment return spectrum.

Investors will have different investing preferences based on their needs, fears, and aspirations. Some would pass on the call option, opting just for the protection. Others would have different strike levels. This Wealth Allocation Framework can be tailored to suit individual requirements including, of course, the traditional Markowitz investor's. However, even though this is a real-world example using commonly traded securities

and options, it is limited in scope and can be impractical to implement.

The above example demonstrates clearly the power of the Wealth Allocation Framework to tailor a portfolio to meet an investor's personal needs and risk preferences. However, there are at least two limitations to this approach that need to be addressed.

First, time horizons for individuals are much longer than two years, often ranging in decades. Liquid, market-traded call and put options typically have much shorter lifetimes, on the order of months to two years. This implies that, to execute such a strategy over a long period of time, we will need to construct a dynamic risk-return overlay strategy to buy more options periodically.

There is tremendous execution risk in dynamical strategies. If the market is crashing and you decide you want protection, puts at that moment of time will be extremely expensive. Similarly, in a bull market calls become extremely expensive. Thus dynamical strategies requiring constant intervention in the markets often fail precisely at the moment when they are needed the most. This fact was painfully recognized by the holders of portfolio insurance, a strategy that peaked in popularity in the 1980s and never recovered after the market crash of 1987.

Second, investors desire (and need) such protection and upside potential to cover all of their financial assets, not just their liquid investment portfolio. Put and call options often exist only on liquid market securities.

Therefore this strategy needs both to be generalized to cover all of the individual's assets and to be executed in a systematic manner that does not require constant market intervention. In other words, we need to choose asset types and the right risk allocation, so that parts of the portfolio "partially" self-hedge during bear markets,<sup>22</sup> while other parts automatically outperform during bull markets, without constant market intervention.

This strategy will be judiciously combined with some amount of market intervention, including periodic rebalancing, which is, and usually will be, necessary.

## 7. RISK ALLOCATION

Individuals have more complex wealth profiles. They have multiple (often conflicting) goals and constraints and their portfolios include several different kinds of assets, all of which need to be considered simultaneously. Before we delved into the simplified example we introduced the concept of risk allocation. Accordingly, portfolio assets as well as appropriate risk-adjusted benchmarks need to be assigned to each of the personal risk, market risk, and aspirational risk buckets.

### 7.1 Benchmarks

Investors should have very different performance expectations for the assets allocated to each of the three risk buckets, and these expectations must be benchmarked against appropriate indices (*Exhibit 8, below*). The idea of having a different benchmark for each of the three parts of the portfolio is an important one. In the first bucket one pays for and receives safety. In the third bucket one gets outsized returns, unfortunately accompanied by a significant probability of loss of capital. These two parts of the portfolio, in general, will behave differently than the middle portion, which can be benchmarked against risk-adjusted market indices.

In fact, often the entire portfolio will be mean-variance inefficient, when viewed in the narrower mean-variance Framework, but will provide more robust protection and upside, when viewed over a wider range of outcomes.

- Assets in the personal risk bucket should be expected to appreciate at below-market rates. Suitable benchmarks are the Consumer Price Index or three-month LIBOR. Suitable risk measures could use downside risk rather than volatility.
- Assets in the market risk bucket follow the standard Markowitz Framework. Their performance can be compared to a standard benchmark constructed from appropriate weighting of the S&P 500 and an aggregate bond index. Similarly, the Sharpe ratio can be used to provide a suitable risk-adjusted measurement.
- Assets in the aspirational risk bucket should significantly outperform standard market indices when they succeed. Examples of such benchmarks could be *Forbes* magazine’s Cost of Living Extremely Well Index (CLEWI),<sup>23</sup> a hedge fund index, or a large alpha over a standard market index. Other risk measures could incorporate default probabilities or use upside risk rather than volatility.

**EXHIBIT 8**  
**PERFORMANCE AND RISK MEASUREMENT BASIS FOR EACH RISK BUCKET**

“Personal” Risk “Do Not Jeopardize Basic Standard of Living”	“Market” Risk “Maintain Lifestyle”	“Aspirational” Risk “Enhance Lifestyle”
PROTECTIVE ASSETS	MARKET ASSETS	ASPIRATIONAL ASSETS
<p><b>Expected Performance</b> Below market returns for below market risks</p> <p><b>Sample Benchmarks</b> Consumer price inflation Three-month LIBOR</p> <p><b>Risk Measures</b> Downside risk Scenario analysis</p>	<p><b>Expected Performance</b> Market returns and market risks</p> <p><b>Sample Benchmarks</b> S&amp;P 500 Lehman Agg. Bond MSCI World Index</p> <p><b>Risk Measures</b> Standard deviation Sharpe ratio Beta Scenario analysis</p>	<p><b>Expected Performance</b> Above market returns with high targeted risks</p> <p><b>Sample Benchmarks</b> CLEW Index Absolute return value</p> <p><b>Risk Measures</b> Upside return measures Manager alpha Scenario analysis</p>

EXHIBIT 9  
ASSET CLASSIFICATIONS FOR EACH RISK BUCKET

“Personal” Risk “Do Not Jeopardize Basic Standard of Living”	“Market” Risk “Maintain Lifestyle”	“Aspirational” Risk “Enhance Lifestyle”
PROTECTIVE ASSETS	MARKET ASSETS	ASPIRATIONAL ASSETS
<ul style="list-style-type: none"> <li>▪ Cash</li> <li>▪ Home purchase</li> <li>▪ Home mortgage</li> <li>▪ Partially protected investments:                             <ul style="list-style-type: none"> <li>▪ US TSY (Short Duration)</li> <li>▪ TIPS</li> <li>▪ Principal protected funds</li> </ul> </li> <li>▪ Traditional annuities to provide safe source of income and hedge longevity risk</li> <li>▪ Hedging through calls/puts/collars</li> <li>▪ Insurance</li> <li>▪ Human capital</li> </ul>	<ul style="list-style-type: none"> <li>▪ Equities:                             <ul style="list-style-type: none"> <li>▪ Broad size &amp; style &amp; sector exposure</li> </ul> </li> <li>▪ Fixed income                             <ul style="list-style-type: none"> <li>▪ Credit quality and duration diversification</li> </ul> </li> <li>▪ Cash (reserved for opportunistic investing)</li> <li>▪ Strategic investment:                             <ul style="list-style-type: none"> <li>▪ Funds of funds</li> </ul> </li> <li>▪ Liquid “non-traditional” investments e.g., commodities</li> </ul>	<ul style="list-style-type: none"> <li>▪ Alternative investments:                             <ul style="list-style-type: none"> <li>▪ Private equity</li> <li>▪ Hedge funds</li> </ul> </li> <li>▪ Investment real estate</li> <li>▪ Investment concentration</li> <li>▪ Small business</li> <li>▪ Concentrated stock and stock option positions</li> </ul>

EXHIBIT 10  
NET WORTH STATEMENT FOR THE EXECUTIVE

NET WORTH																			
<p><b>Personal Assets</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Primary Residence</td> <td style="text-align: right;">\$1,500,000</td> </tr> <tr> <td>Investment Real Estate</td> <td style="text-align: right;">\$ 400,000</td> </tr> <tr> <td><b>Total Personal Assets</b></td> <td style="text-align: right;"><b>\$1,900,000</b></td> </tr> </table>		Primary Residence	\$1,500,000	Investment Real Estate	\$ 400,000	<b>Total Personal Assets</b>	<b>\$1,900,000</b>	<p><b>Other Assets</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Employee Stock Options</td> <td style="text-align: right;">\$100,000</td> </tr> <tr> <td><b>Total Other Assets</b></td> <td style="text-align: right;"><b>\$100,000</b></td> </tr> <tr> <td><b>Total Assets</b></td> <td style="text-align: right;"><b>\$5,500,000</b></td> </tr> </table>		Employee Stock Options	\$100,000	<b>Total Other Assets</b>	<b>\$100,000</b>	<b>Total Assets</b>	<b>\$5,500,000</b>				
Primary Residence	\$1,500,000																		
Investment Real Estate	\$ 400,000																		
<b>Total Personal Assets</b>	<b>\$1,900,000</b>																		
Employee Stock Options	\$100,000																		
<b>Total Other Assets</b>	<b>\$100,000</b>																		
<b>Total Assets</b>	<b>\$5,500,000</b>																		
<p><b>Investment Assets</b></p> <p><b>Portfolio Assets</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Equity Portfolio</td> <td style="text-align: right;">\$1,500,000</td> </tr> <tr> <td>Concentrated Stock</td> <td style="text-align: right;">\$1,250,000</td> </tr> <tr> <td>Fixed Income Portfolio</td> <td style="text-align: right;">\$350,000</td> </tr> <tr> <td>Cash Equivalents</td> <td style="text-align: right;">\$150,000</td> </tr> <tr> <td><b>Total Portfolio Assets</b></td> <td style="text-align: right;"><b>\$3,250,000</b></td> </tr> </table>		Equity Portfolio	\$1,500,000	Concentrated Stock	\$1,250,000	Fixed Income Portfolio	\$350,000	Cash Equivalents	\$150,000	<b>Total Portfolio Assets</b>	<b>\$3,250,000</b>	<p><b>Liabilities</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Mortgage on Primary Residence (5.5% adjustable rate)</td> <td style="text-align: right; vertical-align: bottom;">\$700,000</td> </tr> <tr> <td>Mortgage on Investment Real Estate (7.5% adjustable rate)</td> <td style="text-align: right; vertical-align: bottom;">\$300,000</td> </tr> <tr> <td><b>Total Liabilities</b></td> <td style="text-align: right;"><b>\$1,000,000</b></td> </tr> </table>		Mortgage on Primary Residence (5.5% adjustable rate)	\$700,000	Mortgage on Investment Real Estate (7.5% adjustable rate)	\$300,000	<b>Total Liabilities</b>	<b>\$1,000,000</b>
Equity Portfolio	\$1,500,000																		
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<b>Total Liabilities</b>	<b>\$1,000,000</b>																		
<p><b>Retirement Assets</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Equities</td> <td style="text-align: right;">\$0</td> </tr> <tr> <td>Fixed Income</td> <td style="text-align: right;">\$250,000</td> </tr> <tr> <td>Cash Equivalents</td> <td style="text-align: right;">\$0</td> </tr> <tr> <td><b>Total Retirement Assets</b></td> <td style="text-align: right;"><b>\$250,000</b></td> </tr> <tr> <td><b>Total Investment Assets</b></td> <td style="text-align: right;"><b>\$3,500,000</b></td> </tr> </table>		Equities	\$0	Fixed Income	\$250,000	Cash Equivalents	\$0	<b>Total Retirement Assets</b>	<b>\$250,000</b>	<b>Total Investment Assets</b>	<b>\$3,500,000</b>	<p><b>Total Net Worth</b></p> <p style="text-align: right;"><b>\$4,500,000</b></p>							
Equities	\$0																		
Fixed Income	\$250,000																		
Cash Equivalents	\$0																		
<b>Total Retirement Assets</b>	<b>\$250,000</b>																		
<b>Total Investment Assets</b>	<b>\$3,500,000</b>																		

For an excellent discussion of several new benchmarks for managing risk relating both to individual and national risk factors see Shiller.<sup>24</sup>

7.2 Classification of Assets

It is not hard to determine the suitability of different assets and securities for these risk buckets. *However, both the type of security and the purpose it serves in the portfolio determine the placement of each asset into one of the three different risk buckets.* Therefore, the same security can belong in different buckets for different individuals.

Securities that provide some degree of stability or principal protection clearly fall in the personal risk bucket. Examples are cash, short-term government-backed Treasury bonds, TIPS (i.e., bonds that provide inflation protection in exchange for a lower yield), principal-protected mutual funds, annuities of certain kinds, and option hedges such as puts and collars.

Other assets that we now include in this bucket are:

- Primary residence, offset by the liability of a mortgage;
- Insurance on automobile, home, catastrophe, disability, and life, offset by the premiums;
- Human capital, i.e., earning power, offset by educational debts.

Most conventional securities fall into the market risk bucket, as long as they are part of a diversified portfolio. Alternative investments, like funds of hedge funds, commodities, etc., can belong here as part of a diversification strategy, as long as transaction costs, liquidity constraints, and manager risks are mitigated.

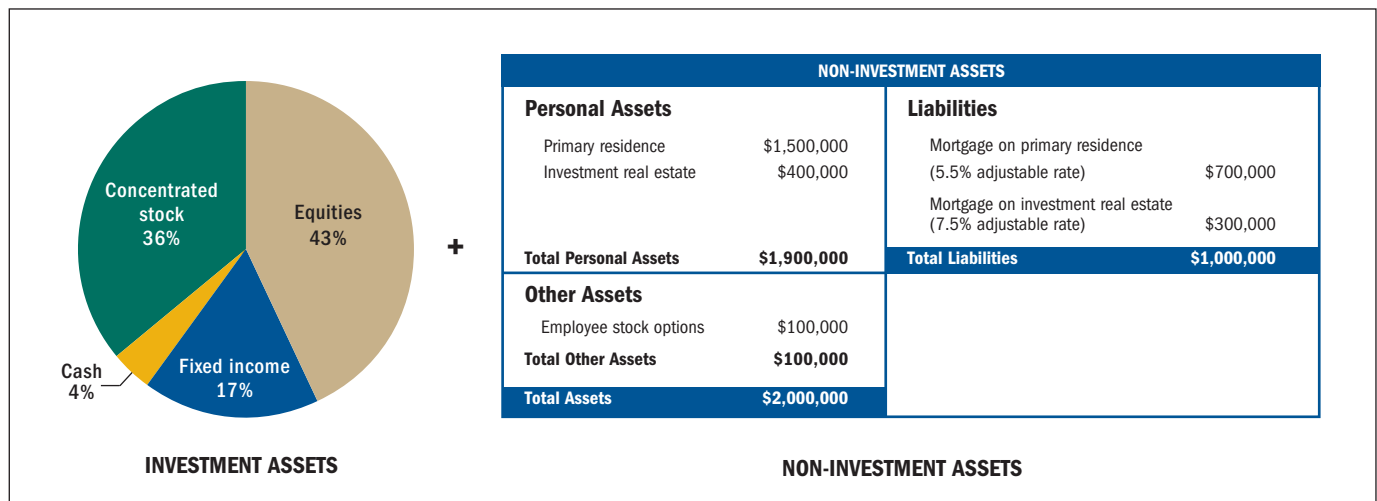
Executive stock options, concentrated stock positions, single-manager hedge funds, leveraged investment real estate, and call options are examples of investments that fall in the aspirational risk bucket. A family-owned business that forms a significant part of an individual’s wealth would also belong here. For more examples see Exhibit 9 on page 12.

8. AN AFFLUENT INVESTOR EXAMPLE: A HIGH-LEVEL OVERVIEW

It is important to emphasize that the Wealth Allocation Framework can be implemented rather simply. A high-level overview can identify key issues quickly. Further analysis, for example inclusion of cash flows and Monte Carlo simulations, naturally leads to more accurate and detailed solutions.

Let us demonstrate this with an example. Consider an executive whose net worth is summarized in Exhibit 10 on page 12.

EXHIBIT 11 EXECUTIVE’S ASSET ALLOCATION AND NET WORTH STATEMENT IN THE CONVENTIONAL FRAMEWORK

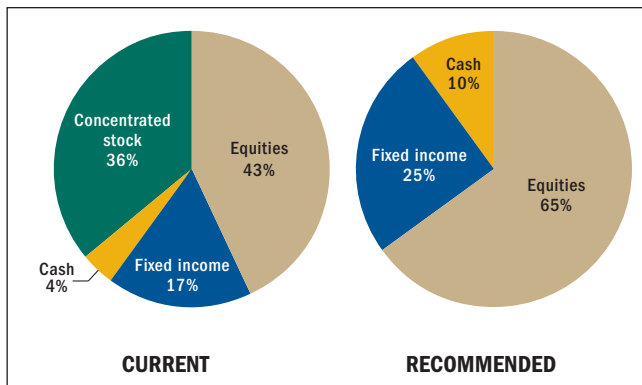


**8.1 Identification of Market Risk Factors in Traditional Approach**

In the traditional approach (*Exhibit 11, page 13*), we consider only market portfolio (investment assets) and ignore the other assets and liabilities from the asset allocation analysis. The investor is often advised to get a comprehensive financial plan to address cash flow, estate planning, and other issues. The asset allocation process in the traditional approach involves the following steps to minimize market risk.

1. Identification of concentrated stock positions and their diversification.
2. Readjustment of the asset allocation based on investor's risk tolerance.
3. Diversification of equity allocation across different market sectors and size (based on market capitalization) and style (value or growth) factors.

**EXHIBIT 12  
EXECUTIVE'S CURRENT AND RECOMMENDED ASSET ALLOCATIONS FOR THE INVESTMENT ASSETS IN CONVENTIONAL FRAMEWORK**



4. Diversification of fixed income allocation across maturities and credit quality.
5. Possible inclusion of alternative investments, e.g., hedge funds, commodities, private equity, to achieve further diversification and superior risk adjusted returns.

Assuming that the executive is a moderate investor, one possible asset-allocation mix is shown in Exhibit 12 on this page.

Two major challenges in the traditional approach are:

1. Convincing clients to liquidate *all* of their concentrated stock position and invest in a diversified portfolio. This is a traditional stumbling block for clients, as it is often the above-average return of that particular stock that has led to their wealth, and thus, correspondingly, that stock constitutes a disproportionate part of their total investment assets.
2. Constructing and maintaining an investment portfolio that takes into account the advice provided by the executive's overall financial strategy. In particular, updates to broad financial strategies are typically done only once every few years while investment portfolios are readjusted to market conditions much more frequently.

**8.2 Asset Allocation Construction in Wealth Allocation Framework**

The new Framework (*Exhibit 13, page 15*) allows the investor to classify all of his assets and liabilities. Three important high-level questions that need to be covered are:

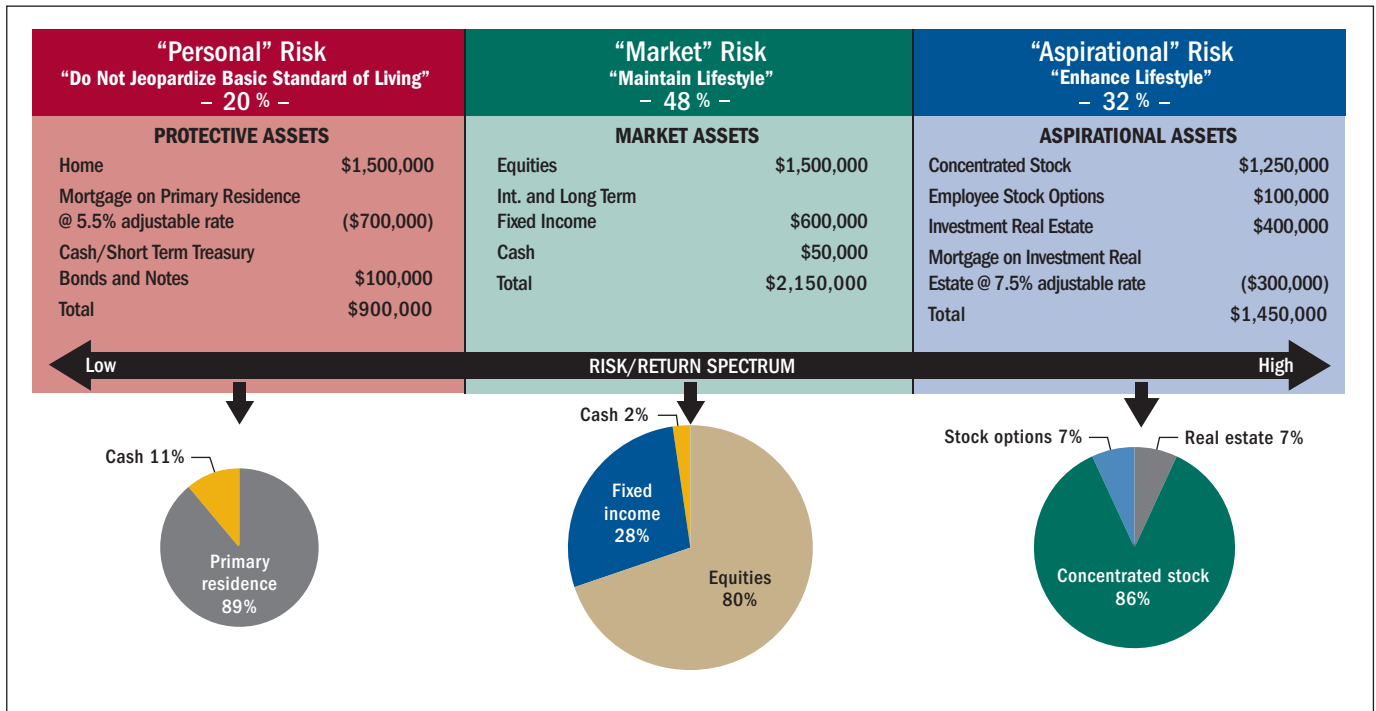
1. What are my (personal, market, and aspirational) risk factors?
2. Do I have the correct risk allocation?
3. Do I have the right asset allocation within each risk bucket?

The answers to these questions must be first estimated and answered qualitatively, and then quantitatively, if possible.

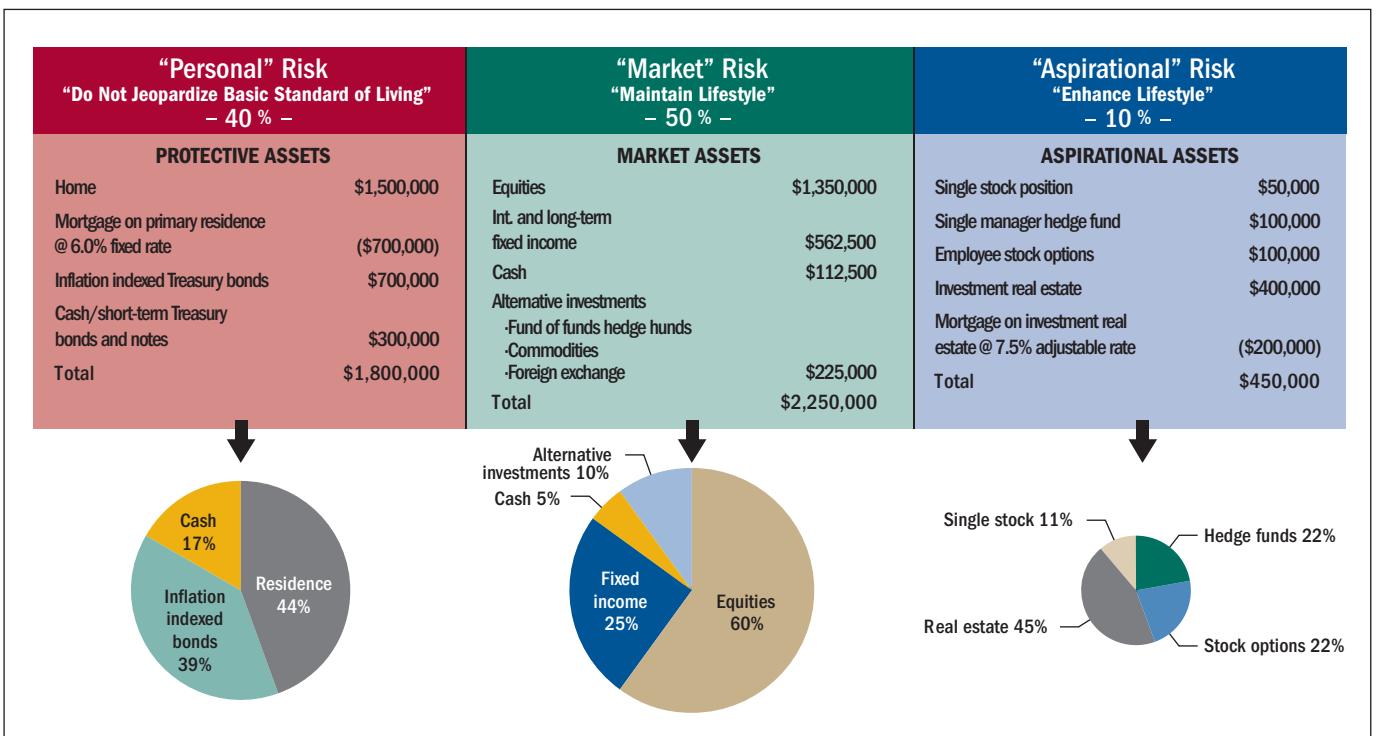
Our simple risk analysis shows that the executive in our example has a 20%:48%:32% allocation across the personal, market and aspirational risk buckets. Intuitively, it seems that 32% is perhaps too large a portion of the portfolio to allocate for aspirational reasons. At the same time, one may wonder whether the assets allocated to the personal risk bucket (20%) protect him adequately from his personal risk factors.



**EXHIBIT 13**  
EXECUTIVE'S CURRENT RISK AND ASSET ALLOCATION IN THE WEALTH ALLOCATION FRAMEWORK



**EXHIBIT 14**  
EXECUTIVE'S RECOMMENDED RISK AND ASSET ALLOCATION IN THE WEALTH ALLOCATION FRAMEWORK



**EXHIBIT 15 COMPARISON OF PERFORMANCE UNDER DIFFERENT SCENARIOS**

Scenario	Description	Expected Return			Current		Recommended	
		Personal Portfolio (%)	Market Portfolio (%)	Aspirational Portfolio (%)	Net Worth (\$)	Net Return (%)	Net Worth (\$)	Net Return (%)
1	Short-Term Underperformance	4	-20	-100	2,656,000	-41	3,672,000	-18
2	Long-Term Underperformance	4	0	-50	3,811,000	-15	4,347,000	-3
3	Likely-I	4	7	-20	4,396,500	-2	4,639,500	3
4	Likely-II	4	7	20	4,976,500	11	4,819,500	7
5	Optimistic	4	10	50	5,476,000	22	5,022,000	12
6	Long Shot	4	20	100	6,416,000	43	5,472,000	22

A simple overview of the client risk factors is provided below:

**Personal Risk:**

- An exposure to floating-rate mortgages exposes the investor to the risk of rising interest rates.
- Try to understand if the client’s goal of maintaining a minimum net worth of \$3 million is realistic.
- Cash reserves are too low and may lead to a liquidity crunch.

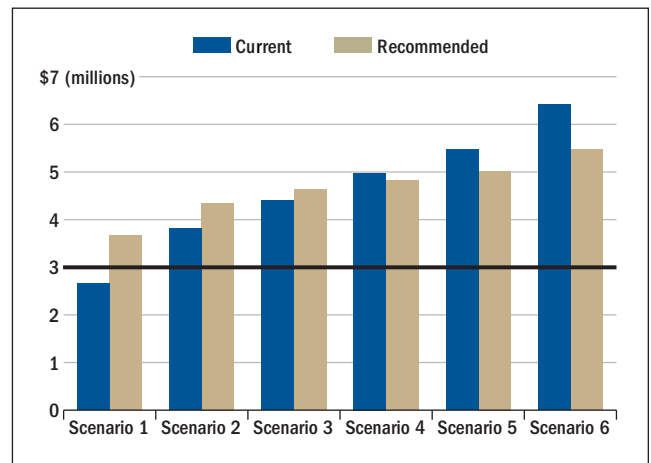
**Market Risk:**

These factors dealing with diversification were covered earlier in reviewing the traditional approach to asset allocation.

**Aspirational Risk:**

- Too large an exposure to a single company stock and stock options.
- Exposure to short-term interest rate through a large floating-rate mortgage for his investment real estate.

**EXHIBIT 16 COMPARISON OF PERFORMANCE DIFFERENCE UNDER DIFFERENT SCENARIOS**



The recommended asset allocation summarized in Exhibit 14 on page 15, was arrived at by taking into account the above risk factors and the client’s financial objectives.

A summary of the recommended changes and rationale behind them is given below.

**Personal Risk:**

- The overall amount of assets in this bucket was increased in order to lower the client’s personal risk.

- Inflation risk and the desire to maintain a minimum wealth level of \$3 million led to the purchase of TIPS as well as an increase in the cash reserves.
- The floating-rate mortgage was switched to a (slightly higher rate) fixed-rate mortgage to decrease the investor's exposure to rising interest rates.

#### *Market Risk:*

The portfolio was fully diversified in accordance with the tenets of Modern Portfolio Theory. Note that, in addition to rebalancing the basic asset classes, we added alternative investments in the form of a fund of hedge funds, as well as limited exposure to commodities and foreign exchange due to their diversification benefits.

#### *Aspirational Risk:*

- The overall assets in this bucket were decreased, because the client was taking on too much aspirational risk.
- The concentrated stock position was decreased, some of which went to the personal risk bucket for the purchase of TIPS. The rest of the proceeds were used to reduce the amount of the floating-rate mortgage for the investment property, and to buy a single-manager absolute return hedge fund.
- There is now some diversification, i.e., a better balancing of different risk exposures in this bucket.

In the next section we will show that the new portfolio also does better under a variety of different scenarios and market shocks.

### 8.3 Scenario Analysis

A quick and simple scenario analysis of the client's current and recommended asset allocations is shown in Exhibits 15 and 16 on page 16. The first scenario also incorporates, for example, the possibility of the bankruptcy of the company associated with the client's single stock position.

Note that the expanded strategy concentrates on incorporating the goals and risk preferences of the investor (such as minimizing the chances of having a net worth below \$3 million), in addition to attempting to immunize the client from the identified client risk factors, including market crashes.

Once the correct allocations have been made in the three buckets, the middle bucket should be diversified as prescribed by MPT. In the Wealth Allocation Framework there is no reason not to diversify the holdings in the middle (market risk) bucket—as MPT explains, you do not get paid for holding non-systematic risk. The aspirational bucket, however, retains some portion of the concentrated stock.

### 8.4 Impact of Market Shocks

The scenarios analyzed above capture effectively the impact of market shocks. One such shock the market recently experienced was the bursting of the technology bubble, Tech-Wreck, in year 2000. We analyze the impact of this event on the investor's current and recommended portfolios.

- We assume a nominal 5% decline in the investor's investment real estate during this period and no appreciable change in the value of primary residence.
- We study the impact of the investors holding concentrated stock positions in one or two randomly selected technologies or telecommunication companies.

The impact of this market shock event on different markets and the current and recommended asset allocations is summarized in Exhibit 17 on page 18. It can be observed that the impact of market shocks on the investor's net worth is relatively small for the recommended asset allocation in the Wealth Allocation Framework, when compared with the current asset allocation. This is due to the fact that assets are more appropriately distributed between the three risk buckets, which take into view the investor's entire financial situation.

To keep this example simple, we decided to note the human capital but not to compute or use its value in the risk allocation. We could have instead explicitly present valued the cash flows (current salary and future Social Security income) and adjusted the personal risk bucket accordingly.<sup>25</sup> However, even when the earning capacity is included simply as a risk factor, the client is led to a judgment of how stable that is and may decide to lighten up on the aspirational bucket, if needed. Alternatively, the client may decide to continue to earn on a limited basis even after retiring and feel confident about his large aspirational risk allocation.

## EXHIBIT 17 IMPACT OF TECH-WRECK EVENT ON U.S. MARKETS

Market	Benchmark Index	Tech-Wreck Event Impact*
Equity	S & P 500	-23.04%
Fixed Income	Merrill Lynch Domestic Master Bond Index	8.11%
Cash	US 30-Day T-Bill	3.45%
Inflation Indexed Treasury Bonds	Merrill Lynch U.S. Treasury Inflation-linked Securities Index	9.22%
Technology Stock	-	-26.97%
Telecommunications Stock	-	-74.63%
Alternative Investments	CSFB Tremont Hedge Fund Index	-0.44%
Current Allocation With Tech Stock	-	-15.02%
Current Allocation With Telcom Stock	-	-29.32%
Recommended Allocation With Tech Stock	-	-6.11%
Recommended Allocation With Telcom Stock	-	-8.76%

\*Source: Based on Ibbotson Encorr data for the broad market indices during the period September 2000 to March 2001.

A more detailed analysis (schematically outlined in Appendix B) uses cash flows and measures such as maximum loss and allows the investor to optimize on the use of annuities to mitigate the prospect of outliving his assets. The objective is to immunize the client against all of his risk factors.

### 9. APPLYING THE WEALTH ALLOCATION FRAMEWORK IN DIFFERENT SITUATIONS

#### 9.1 Goal-Based Asset Allocation Strategies

The concept of personal risk was introduced in Chhabra and Zaharoff<sup>20</sup> in the context of setting an asset allocation strategy to meet the client's goals.

The definition of both personal risk and market risk used in that article have been refined and expanded to form essential building blocks of the Wealth Allocation Framework.

The Wealth Allocation Framework allows clients to segment their assets and create appropriate financial

strategies toward particular goals, while assuming a consistent overall approach to resource allocation.

#### 9.2 The Role of Alternative Investments (Including Commodities and Foreign Exchange) in Investment Portfolios

Alternative investments such as hedge funds, private equity, real estate, futures, commodities, and FX have in recent years become an integral part of the investment portfolios of the wealthy. If these investments have beneficial roles in the portfolios of the affluent, do they also have a similar role in the portfolios of all investors?

The Wealth Allocation Framework looks at all of these investments in terms of both their particular risk-return characteristics and the role they play in investors' portfolios, i.e., hedging, diversification, or a pure absolute return strategy. For these classes of securities it is crucial to weigh the benefits of their inclusion against counteracting factors, such as higher transaction costs, fees, minimum investment thresholds, liquidity constraints, and higher default risks, as well as suitability and transparency issues, in order to arrive at a decision.

Fixed-income securities with lower credit quality have many of the same issues described above; however, individuals increasingly hold fixed-income mutual funds that are diversified in credit quality. The underlying thinking is that every portfolio needs exposure to the fixed-income markets and there is a risk-return trade-off between accepting the risk from lower-credit-quality fixed-income securities and receiving higher yields.

The same logic applies to markets other than fixed income. Securities that hedge against various risk factors also provide similar risk-return trade-offs.

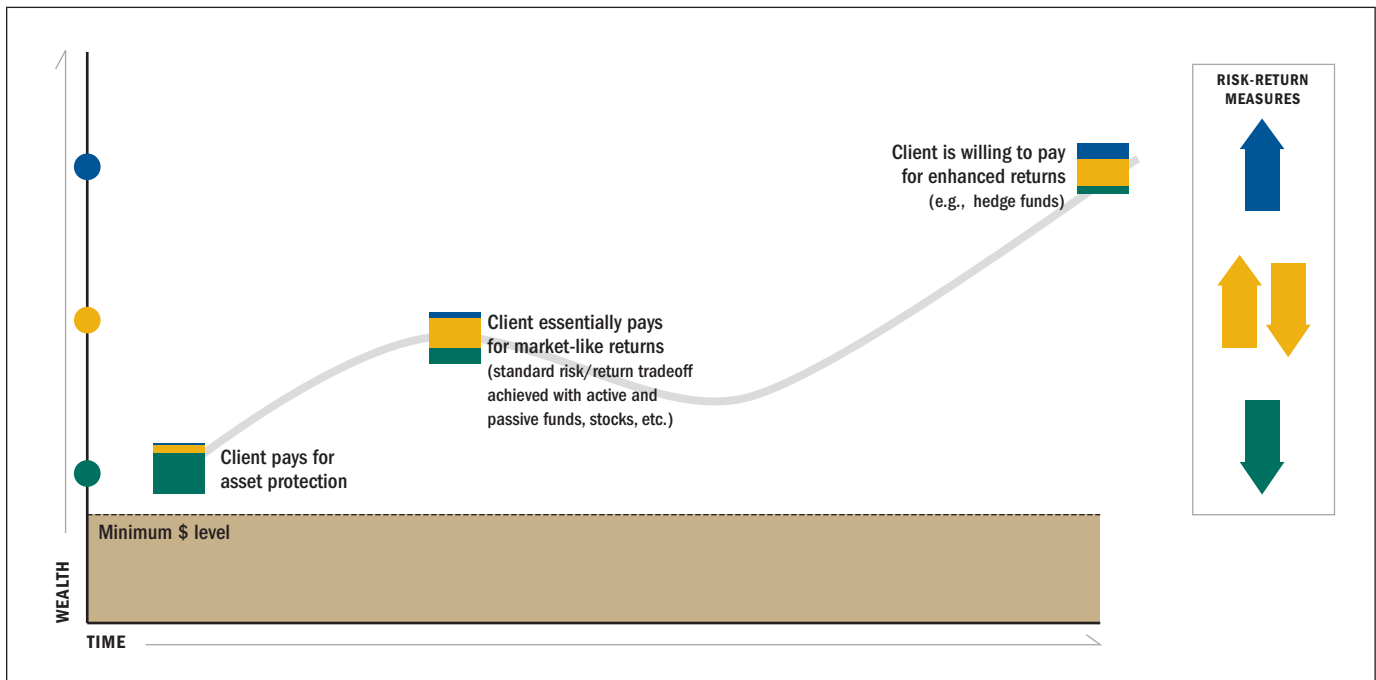
The price of a gallon of gas is related to the price of a barrel of oil. Other commodities such as precious metals, natural gas, and agricultural products have a natural connection with the cost of living and inflation. However, traditionally, the presence of commodities in investors' portfolios has been limited to gold, often in its physical form. Investors would benefit from liquid, low-cost ways to hedge exposures to broad-based commodity indexes.

Similarly, investors are strongly exposed to country default and currency devaluation risks. These risks are often neglected, but they do occur frequently, e.g., in recent

years in Argentina, Russia, and Korea. A pure FX hedge (which may be not just on the investment portfolio but also on other investments such as real estate holdings or business contracts) would have an underlying cost associated with it and would belong in the personal risk bucket. However, FX can also serve as a diversifier, in which case it can be a small percentage of a diversified portfolio in the market risk bucket. On the other hand, a speculative FX position naturally carries the associated risk of losing one's investment and would clearly be categorized in the aspirational risk bucket.

Similar arguments can be made regarding hedge funds. While single-manager absolute-return hedge funds are clearly "aspirational investments," a broad-based portfolio that diversifies across different managers and investment strategies could form an alternative and attractive diversifier, when compared, for example, with the addition of a portfolio of emerging-market high-yield bonds. Some of the challenges that need to be addressed in order to facilitate a wider use of these investments are greater transparency of the active strategy and current holdings within hedge funds in order to mitigate operational risk; removal of liquidity constraints; lowering of cost structures in terms of both

**EXHIBIT 18  
DYNAMIC RISK ALLOCATION**



fees and minimum investments; availability and sharing of good historical data; establishment of widely accepted representative indexes or benchmarks; and good estimates of the after-tax risk-return characteristics of these investments.

### 9.3 Use of Real Estate as a Diversifier

In recent years, the outperformance of the real estate market has caused investors to look favorably at real estate as a diversifier to investing in the capital markets. The question of what risk bucket the real estate holdings belong in is answered by reiterating our criterion for asset classification: *Both the security type and the purpose it serves in the portfolio determine the placement of each asset into one of the three risk buckets.*

A sensible primary home, together with its mortgage, fits in the personal risk bucket. An investment property like a condominium for rental purposes could belong in either the market risk bucket or the aspirational risk bucket depending on the leverage used. If the asset to liability ratio is large, and the location is relatively stable, then the condominium belongs in the market risk bucket, where it serves to diversify the risk-return characteristics of the investment portfolio. If the asset-liability ratio is small, i.e., the position is highly leveraged, or if the location is “filled with potential,” then clearly the investor is hoping for outsized gains (in comparison to the down payment) but could also end up losing most of the down payment. This investment then would clearly belong in the aspirational bucket. In the client example discussed earlier, the investor split his aspirational risk between a condominium and a concentrated stock position. The client risk factors here would clearly be the ability to hold on to the property through a down market as well as the liability aspects of holding real estate.

### 9.4 Incorporating Executive Stock Options and Company Stock

Stock options are an important and efficient way of compensating executives. This piece obviously belongs in the aspirational risk bucket, for it is both highly leveraged and strongly correlated to human capital and source of income of the individual. If any of the stock or stock options can be hedged, then depending on the structure of the hedge, the hedged portion would move to the personal or market risk bucket.

It is not uncommon to neglect the value of the unhedged piece while considering retirement savings.

An interesting and important contrast between Modern Portfolio Theory and the Wealth Allocation Framework was brought out in the client example with respect to concentrated stock. It is worth repeating that MPT would suggest complete diversification from the concentrated position. The Wealth Allocation Framework attempts to work out an appropriate percentage of the position the client may still retain in order to balance the allocations to the three different risk buckets.

### 9.5 Dynamic Characteristics of Optimal Risk Allocation

The investor’s optimal risk allocation depends not just on the relative risk-return characteristics of markets, but also on how much wealth an investor has relative to what she needs and how far away from the danger zone she is. This is a dynamic situation that is illustrated in Exhibit 18 on page 19.

If the individual is in the danger zone, she should be more conservative. She will value more highly investments that do not go down. This means that the relevant risk measure will weigh more heavily the possibility or danger of negative returns, rather than the possibility of upside returns; for example, she will look more favorably at a principal-protected mutual fund (with correspondingly limited upside) than at a conventional unhedged security. This risk allocation will be dominated by personal risk (*Exhibit 19, page 21*).

If the investor has a decent cushion from the danger zone, then her allocation is similar to that of the aggregate market and the appropriate risk measure is similar or identical to the one used by the financial markets, i.e., volatility. This risk allocation will be overweighted by assets in the market risk bucket. The benefits of being in this zone are that, since one has risk-return considerations similar to the aggregate market, one invests in liquid and (comparatively) low-transaction-cost securities such as stocks and bonds. As investors get wealthier, they begin to look for investments that allow for further upside potential, e.g., some types of hedge funds or venture capital. In this region, they are willing to take greater risks, i.e., possible loss of principal (*Exhibit 20, page 21*).



**EXHIBIT 19**  
**SAMPLE RISK ALLOCATION FOR A CONSERVATIVE INVESTOR**

	<b>“Personal” Risk</b> Do Not Jeopardize Basic Standard of Living	<b>“Market” Risk</b> Maintain Lifestyle	<b>“Aspirational” Risk</b> Enhance Lifestyle
<i>Conservative Investor</i>	60%	30%–40%	0%–10%

**EXHIBIT 20**  
**SAMPLE RISK ALLOCATION FOR AFFLUENT AND WEALTHY INVESTORS**

	<b>“Personal” Risk</b> Do Not Jeopardize Basic Standard of Living	<b>“Market” Risk</b> Maintain Lifestyle	<b>“Aspirational” Risk</b> Enhance Lifestyle
<i>Affluent Investor</i>	40%	40%–60%	0%–20%
<i>Wealthy Investor</i>	SMALL/MEDIUM	MEDIUM/LARGE	MEDIUM/LARGE

Their risk measure is therefore weighted more toward the potential of upside gains than to the possibility of negative returns. This risk allocation will be overweighted by assets in the aspirational risk bucket.

It is worth noting that the minimum level of wealth shown in Exhibit 18 on page 19 will often vary based on the current wealth of the investor as opposed to a hard number based on the actual amount needed to maintain a lifestyle. This is consistent with Kahneman and Tversky’s<sup>11,12</sup> observations that gains and losses by investors are viewed in relation to a reference level. Finally, these ratios may be affected by other factors, such as the lifecycle stage of the investor.

**9.6 Annuitization Strategy**

With ever-decreasing mortality rates among the U.S. population, longevity risk, i.e., the risk of outliving one’s assets, can be very high, especially for retirees with a family history of longevity. Traditional asset allocation methods based on MPT cannot guarantee protection against longevity risk. By guaranteeing a fixed or variable stream of cash flow for the entire

lifetime of the investor in exchange for a fixed up-front premium, immediate annuities act as an effective hedging strategy for longevity risk. When the analysis of client risk factors indicates exposure to longevity risk, the expanded allocation Framework includes immediate annuities in the asset mix for the personal risk bucket. Depending upon the client’s net worth, lifestyle needs, bequest motive, and risk tolerance, the amount allocated to annuities is then determined. Exhibit 21 on page 22 shows a typical asset allocation in the Wealth Allocation Framework for an investor with high longevity risk. The Wealth Allocation Framework includes annuities in the asset allocation decision by including them in the personal risk bucket. The bulk of the assets is invested in the personal risk bucket (~75%), which includes significant exposure to annuities and inflation-protected securities. The market risk bucket (~20%) provides the necessary cushion to maintain lifestyle in the event of significant inflation and other market risks.

Recently, Chen and Milevsky<sup>26</sup> proposed optimal asset allocation strategies by including annuities in the asset allocation, and Dus and Mitchell<sup>27</sup> showed that a

**EXHIBIT 21**  
**SAMPLE RISK ALLOCATION FOR AN ANNUITIZATION STRATEGY**

	<b>“Personal” Risk</b> Do Not Jeopardize Basic Standard of Living	<b>“Market” Risk</b> Maintain Lifestyle	<b>“Aspirational” Risk</b> Enhance Lifestyle
<i>Annuitization Strategy</i>	75%	20%	5%

**EXHIBIT 22**  
**SAMPLE RISK ALLOCATION FOR A BARBELL STRATEGY**

	<b>“Personal” Risk</b> Do Not Jeopardize Basic Standard of Living	<b>“Market” Risk</b> Maintain Lifestyle	<b>“Aspirational” Risk</b> Enhance Lifestyle
<i>Barbell Strategy</i>	60%	10%	30%

delayed annuitization, in addition to a phased withdrawal scheme, can reduce shortfall probabilities. The Wealth Allocation Framework can incorporate both of these approaches in a flexible manner.

**9.7 Barbell Strategies: Insurance and Lottery Tickets**

We emphasized earlier that the idea of combining downside protection and upside potential is not new. In fact Markowitz himself addressed this issue. In 1952 he published two papers: The first outlined the foundations of MPT<sup>1</sup>; the second,<sup>19</sup> entitled “The Utility of Wealth,” built upon Friedman and Savage’s work<sup>18</sup> and talked about non-concave utility functions based on the simultaneous desire of individuals to pay for insurance and invest in lottery tickets. This idea has been subsequently explored by a number of people including Lopes<sup>28</sup> and Lopes and Oden,<sup>17</sup> who constructed the notion of SP/A portfolios, in which investors decompose their portfolios in terms of a safe portion known as security protection and a risky portion termed the aspiration part. Such a strategy may also be termed a barbell strategy, where investors make sure they have a safe cushion and then invest the rest of the portfolio in an aggressive allocation.

The barbell approach reflects the relative importance of the extremes to the more diversified Markowitz approach. This group is really a risk-seeking group that first protects the basics and then feels free to take on substantial risk (*Exhibit 22, above*). Investing strategies have been put forward to try to replicate these characteristics. We will discuss some of these further in the next section.

**9.8 Option-Based and Dynamical Replication Strategies**

Bodie<sup>29</sup> explores the use of a call-option-based asset allocation strategy for retirement planning. In the standard of living adjustment (SOLA) strategy, the investor buys TIPS to protect herself from credit risk and inflation risk, as well as call options on the equity market. If the options end up in the money, the investor uses the gain to buy more TIPS and more call options and the process goes on.

Other work in option-based investing strategies includes Haugh and Lo,<sup>30</sup> who show that certain dynamic asset allocation strategies can be approximated using simple buy-and-hold strategies that include options, and Van Capelleveen et al.,<sup>31</sup> who study the impact of including options for managing pension funds and find that incorporating options may help the sustainability of pension funds.

Note that our Framework does not exclude these strategies. Rather, it provides an organizational Framework within which these strategies can be evaluated. However, the main thrust of the Framework is to set up a portfolio that provides a majority of protection and upside based on the correct risk allocation and selection of financial instruments, rather than by dynamical replication.

### 9.9 Incorporating Lifestyle Stage and Human Capital

Human capital turns out to be important for bringing both lifestyle and lifecycle considerations into a wealth strategy. It should be clear that doctors or engineers or executives in the early stages of their careers have substantial earning potential. They have human capital that over the years should transfer to financial capital. This investment should be considered as part of the portfolio for mitigating personal risk, and allows individuals to place more investments in the market and aspirational risk buckets. It may also allow them to buy a house (with a mortgage) earlier than someone without such a skill set. On the contrary, someone approaching retirement has mostly depleted his human capital and should consider investing in the aspirational bucket only if he is already affluent. Earlier we provided an example of a barbell approach, e.g., where an investor invests in a mixture of safe and risky assets. This barbell approach is not uncommon among people who have invested substantially in education, such as doctors and management executives. The ability to project (and present value) with some confidence an increasing stream of earnings provides them with the appetite to take on more aspirational risk. This often manifests itself in their buying a bigger house than their finances would suggest prudent at that stage. By incorporating human capital in the personal risk bucket, the Wealth Allocation Framework shows that this behavior is not as imprudent as the conventional Framework might suggest. Merton<sup>32</sup> and Chen<sup>25</sup> make similar arguments that investors should adjust their asset allocation based on the nature and relative size of their human capital in comparison with their investment assets.

### 9.10 The Wealth Allocation Framework Seeks to Protect from Excessive Risk Taking in Bad Times

Prospect theory observes that people demonstrate strong risk aversion when faced with gains of high probability, but are risk seeking when faced with losses of high

probability.<sup>11</sup> *This translates into questionable investment behavior of tending to double up when faced with a near certain loss.* Modern Portfolio Theory, on the other hand, recommends risk aversion in both gains and losses, i.e., it tends to minimize deviations from the mean for both gains and losses. The Wealth Allocation Framework advises putting together a financial strategy that is risk seeking for gains (aspirational bucket) and risk averse for losses of low probability (personal bucket). It is also risk averse in both gains and losses of high probability (market risk bucket). We hope this Framework will prevent individuals from tactically driven risky investment behavior when they are faced with near-certain losses. Its goal is to replace that instinct with a healthy appetite for strategic risk taking, so that individuals can still meet their aspirational goals.

## 10. CONCLUSION

There has been a strong desire to bring the best practices of institutional investing to individual investors. This has resulted in a renewed emphasis on educating investors about the benefits of portfolio diversification. However, five decades after Markowitz outlined the foundations of MPT, most individual investors are not diversified. MPT describes these deviations from diversification as deviations from rational investing.<sup>33</sup> We have tried to understand the reasons for the lack of diversification and emphasized that the risk-return preferences of individual investors are different from those of the markets. To address this, we have built upon Markowitz's work to provide a Wealth Allocation Framework that is suitable for individual investors. This expansion starts with incorporating all of an investor's assets and liabilities including home, mortgage, and human capital, as opposed to just financial assets. We introduce the concepts of personal risk and aspirational risk to supplement the market risk Framework of Markowitz. This allows us to add the ability to provide downside protection and upside potential to the usual diversified core portfolio, based on an individual investor's risk and return preferences. The goal of this Wealth Allocation Framework is to allow for the optimum allocation of risk, i.e., budgeting of one's resources, among the personal, market, and aspirational risk dimensions, to simultaneously meet the investor's safety and aspirational goals while still benefiting from efficient

markets. *In order to achieve an appropriate allocation of wealth for the individual investor, risk allocation must precede asset allocation.*

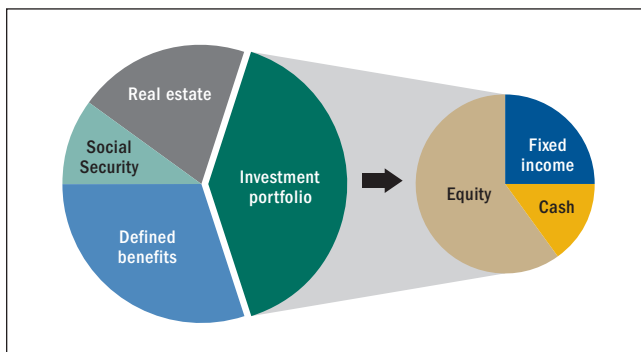
This paper contains information on wealth management principles and is for informational purposes only. It should not be construed as investment advice and does not imply an endorsement by Merrill Lynch. In particular, this presentation is not intended as a recommendation that any investor pursue investment strategies involving listed options, high-yield bonds or alternative investments.

**APPENDIX A**

**Further Details of Markowitz’s Framework**

We would like to provide a quick review of how Markowitz’s Framework is implemented in practice. First, let’s note that the Markowitz portfolio deals mainly with an investor’s investment portfolio (*Exhibit A-1, below*).

**EXHIBIT A-1  
CONVENTIONAL FRAMEWORK**



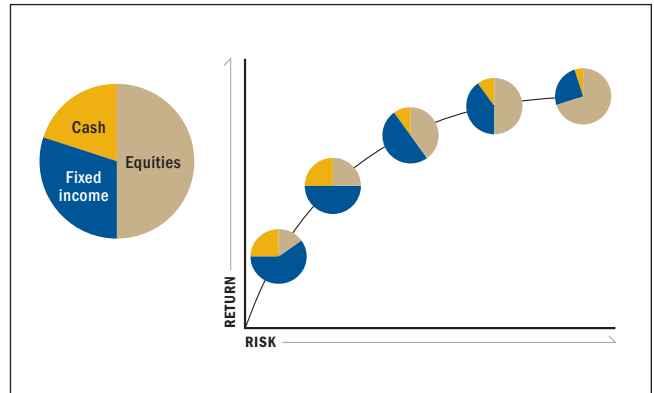
Markowitz’s theory involves understanding that stocks, bonds, and cash are not perfectly correlated. Therefore one can derive substantial diversification benefits from holding the right combination of these asset classes depending on how much risk one is willing to take. Risk and reward are related by the efficient frontier that tells you exactly how much return (on the average) for the amount of risk (on the average) you are willing to take.

Although the details of the theory recommend finding the spot on the efficient frontier that is appropriate to the individual (based on utility function theory) and then leveraging that portfolio to take the risk one wants, this has turned out to be too complicated in practice.

The standard procedure employed is to ask the individual several questions on their risk-return preferences. These are then scored to provide a raw risk score.

Based on the risk level, the investor is guided toward one of the several asset allocation models located on the

**EXHIBIT A-2  
CONVENTIONAL ASSET ALLOCATION FRAMEWORK**



efficient frontier (*Exhibit A-2, above*). This asset allocation may be modified or customized based on investor preferences or needs.

Recently, as the demand for alternative assets (hedge funds, private equity) has increased, their place has been viewed as an additional asset class that provides further diversification benefits due to their low correlation with conventional asset classes. Although the historical record of these investments is quite good, corrections need to be made to raw historical numbers to account for factors such as survivor bias, illiquidity premium and negative skewness. The same remark may be true for U.S. equity markets in general. The U.S. is not only a survivor but a winner in terms of worldwide equity markets over the past century.

The Markowitz Framework is powerful for many reasons. First, one fully benefits from diversification. Mean-variance efficient portfolios provide maximum return for a given level of risk taking. Also, by dealing with liquid securities, transaction costs and bid-ask spreads can be kept to a minimum. A well-diversified portfolio over the long run will provide the return of the underlying asset class. This is not true for an undiversified portfolio that

consists of only a few stocks. That portfolio, while providing the possibility of skyrocketing, also can crash and never recover.

It should be clear that the Wealth Allocation Framework proposed in this article rests heavily on the Markowitz Framework and builds upon it.

**APPENDIX B**

**Summary: Implementation of the Wealth Allocation Framework**

**Step-by-Step Instructions:**

**1. Gather complete diagnostic information:**

- Understand lifecycle details
- Determine client goals and priorities
- Assign cash flows and timelines to each goal
- Classify current assets and liabilities
- Include current and future cash flows
- Complete a risk questionnaire to determine client risk factors and personal danger zone (see Appendix C on this page)

**2. Perform risk allocation and asset allocation, portfolio construction:**

- Categorize and evaluate current state
- Make intuitive adjustments

**3. Compute probability of achieving goals using:**

- Scenario analysis
- Monte Carlo simulations

**4. Readjust:**

- Risk allocation
- Client goals and cash flows
- Asset allocation within each risk bucket

**5. Repeat Steps 1 to 4 until success and optimum balance are achieved.**

**6. Check robustness of solution to market and client risk factors.**

- Market risk factors: crash
- Client risk factors: inflation

**7. Implement.**

**8. Review and readjust as needed.**

**APPENDIX C**

**Evaluating Investor Risk Preferences**

Current methods usually evaluate an investor’s ability to take on market risk by utilizing risk-tolerance questionnaires. The Wealth Allocation Framework balances the client’s financial ability to take risk (an objective risk measure) with the client’s desire to avoid risk (a subjective risk measure). It does this by including questions that uncover the client’s personal and aspirational objectives, risk preferences, and financial situation. Using these as the basis, the Wealth Allocation Framework would arrive at an appropriate risk budget and asset allocation for the three buckets. According to Statman,<sup>34</sup> in order to design the right portfolios for the investors, the portfolio construction process should make use of temperament questionnaires. The current approach can be regarded as a step in this direction. For an

**EXHIBIT C  
IMPLEMENTATION SCHEMA FOR THE WEALTH ALLOCATION FRAMEWORK**

**Step 1: Collect information and determine client’s risk profile**

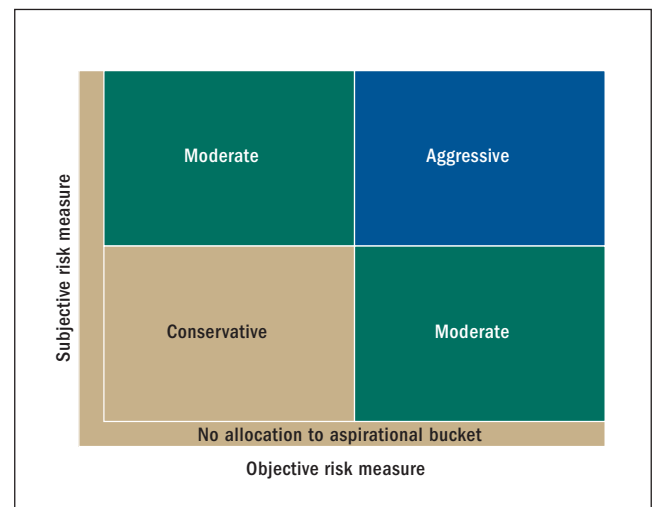
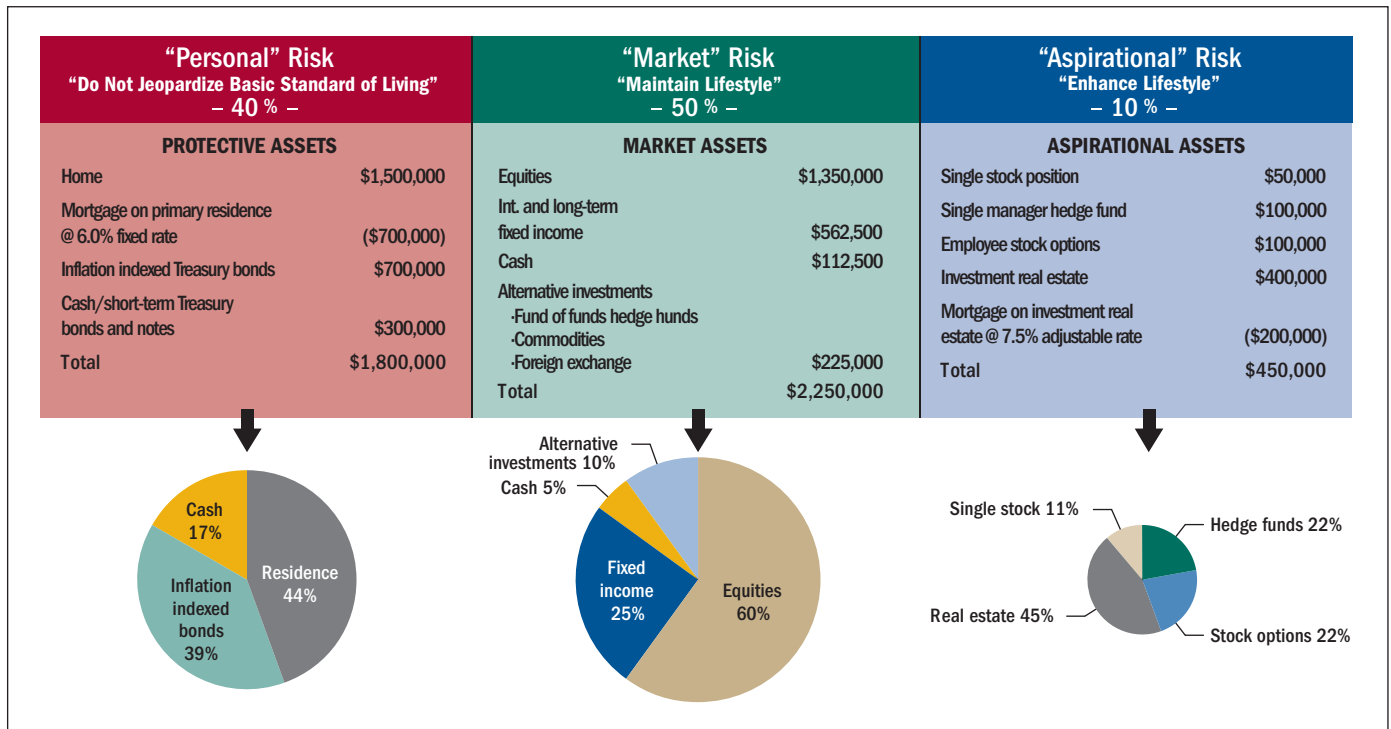


EXHIBIT C (continued)  
IMPLEMENTATION SCHEMA FOR THE WEALTH ALLOCATION FRAMEWORK

Step 2: Determine client’s risk allocation

	Risk Allocation Ranges		
	Personal	Market	Aspirational
Conservative	40%–70%	30%–50%	0%–10%
Moderate	30%–60%	40%–60%	0%–10%
Aggressive	20%–40%	50%–70%	10%–20%

Step 3: Select investments for risk buckets





interesting approach on discerning individual risk and return preferences, see Sharpe et al.<sup>35</sup> and Sharpe.<sup>36</sup>

## Step 1: Collect Information and Determine Client's Risk Profile

### 1. Financial ability to take risk.

- Lifecycle stage—Pre-Retirement or Post-Retirement.
- Current net worth including non-investment assets.
- Cash-flow related information—goals, desired lifestyle, current age, retirement age, etc.

### 2. Desire to avoid risk.

- Minimum Wealth Level
- Target Return

## ENDNOTES

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## REFERENCES

<sup>1</sup> Markowitz, Harry. "Portfolio Selection." *Journal of Finance*, Vol. 7, No. 1 (1952a), pp. 77-91.

<sup>2</sup> Merton, Robert C. "Continuous Time Finance." Blackwell Publishers, 1992.

<sup>3</sup> Goetzmann, W. N., and A. Kumar. "Equity Portfolio Diversification," Working Paper No. 8686, National Bureau of Economic Research, 2003. Available at <http://www.nber.org/papers/w8686>.

<sup>4</sup> Kennickell, Arthur B. "A Rolling Tide: Changes in the Distribution of Wealth in the U.S., 1989-2001." Working Paper No. 393, The Levy Economics Institute, Bard College, November 2003.

<sup>5</sup> Polkovinchenko, V. "Household Portfolio Diversification." Working Paper, University of Minnesota, 2003. Available at <http://www.csom.umn.edu/Assets/4238.pdf>.

<sup>6</sup> Greenspan, Alan. "The Challenge of Central Banking in a Democratic Society." Speech by Chairman of Federal Reserve Board, 1996. Available at <http://www.federalreserve.gov/boarddocs/speeches/1996/19961205.htm>

<sup>7</sup> Shiller, Robert J. *Irrational Exuberance*. Princeton: Princeton University Press, 2001.

<sup>8</sup> Headd, Brian. "Redefining Business Success: Distinguishing Between Closure and Failure." *Small Business Economics*, 21 (2003), pp. 51-61.

<sup>9</sup> Brunel, Jean. "Revisiting the Asset Allocation Challenge Through a Behavioral Finance Lens." *The Journal of Wealth Management*, Vol. 6, No. 2 (2003), pp. 10-20.

<sup>10</sup> Allais, Maurice. "Le Comportement de l'Homme Rationnel devant le Risque: Critique des Postulats et Axiomes de l'Ecole Américaine." *Econometrica*, 21 (1953), pp. 503-546.

<sup>11</sup> Kahneman, Daniel, and Amos Tversky. "Prospect Theory: An Analysis of Decision Making Under Risk." *Econometrica*, Vol. 47, No. 2 (1979), pp. 263-291.

<sup>12</sup> Tversky, A., and D. Kahneman. "Advances in Prospect Theory: Cumulative Representation of Uncertainty." *Journal of Risk and Uncertainty*, 5 (1992), pp. 297-323.

<sup>13</sup> Fabozzi, Frank J., F. Gupta, and Harry M. Markowitz. "The Legacy of Modern Portfolio Theory." *The Journal of Investing*, Fall 2002, pp. 7-22.

<sup>14</sup> Roy, A. D. "Safety First and the Holding of Assets." *Econometrica*, Vol. 20, No. 3 (July 1952), pp. 431-449.

<sup>15</sup> Sahadi, Jeanne. "Wealth Survey: How Do We Stack Up?" 2003. Available at <http://money.cnn.com/2003/01/23/pf/millionaire/fedsurvey/>.

<sup>16</sup> Zaharoff, Alexander. "Beating the Odds." The Challenges of Wealth Series, JPMorgan Private Bank, 2004.

<sup>17</sup> Lopes, L., and G. C. Oden. "The Role of Aspiration Level in Risky Choice: A Comparison of Cumulative Prospect Theory and SP/A Theory." *Journal of Investment Psychology*, 43 (1999), pp. 286-313.

<sup>18</sup> Friedman, M., and L. J. Savage. "The Utility Analysis of Choices Involving Risk." *Journal of Political Economy*, 56 (1948), pp. 279-304.

<sup>19</sup> Markowitz, Harry. "The Utility of Wealth." *The Journal of Political Economy*, Vol. 60, No. 2 (April 1952b), pp. 151-158.

<sup>20</sup> Chhabra, A., and L. Zaharoff. "Setting an Asset Allocation Strategy by Balancing Personal and Market Risks." *The Journal of Wealth Management*, Winter 2001, pp. 30-33.

<sup>21</sup> Sharpe, W., G. J. Alexander, and J. W. Bailey. *Investments*. Englewood Cliffs, NJ: Prentice-Hall, 1998.

<sup>22</sup> Merton, Robert C. "Financial Innovation and the Management and Regulation of Financial Institutions." *Journal of Banking Finance*, 19 (1995), pp. 461-481.

<sup>23</sup> Yen, Jody. "The Cost of Living Extremely Well Index." *Forbes*, December 10, 2001. Available at <http://www.forbes.com/2001/12/10/1203clewi.html>.

<sup>24</sup> Shiller, Robert J. *The New Financial Order*. Princeton: Princeton University Press, 2003.

<sup>25</sup> Chen, Peng. "Human Capital and Asset Allocation for Individual Investors." *Ibbotson Associates Monitor*, July/August 2004.

<sup>26</sup> Chen, Peng, and Moshe A. Milevsky. "Merging Asset Allocation and Longevity Insurance: An Optimal Perspective on Payout Annuities." *Journal of Financial Planning*, Vol. 16, No. 6 (2003), pp. 52-62.

<sup>27</sup> Dus, I., R. Maurer, and O. S. Mitchell. "Betting on Death and Capital Markets in Retirement: A Shortfall Risk Analysis of Life Annuities versus Phased Withdrawal Plans." Working Paper PRC WP 2004-1, Pension Research Council, The Wharton School, University of Pennsylvania, 2004. Available at <http://rider.wharton.upenn.edu/~prc/PRC/WP/wp2004-1rev.pdf>.

<sup>28</sup> Lopes, L. "Between Hope and Fear: The Psychology of Risk." *Advances in Experimental Psychology*, 20 (1987), pp. 255-295.

<sup>29</sup> Bodie, Z. "Retirement Investing: A New Approach." Working Paper PRC WP 2001-8, Pension Research Council, The Wharton School, University of Pennsylvania, February 2001.

<sup>30</sup> Haugh, M. B., and A. Lo. "Asset Allocation and Derivatives." *Quantitative Finance*, 1 (2001), pp. 45-72.

<sup>31</sup> Van Capelleveen, H. F., H. M. Kat, and Theo P. Kocken. "How Derivatives Can Help Solve the Pension Fund Crisis." Working Paper WP-0312, Cass Business School, London, 2003.

<sup>32</sup> Merton, Robert C. "Thoughts on the Future: Theory and Practice in Investment Management." *Financial Analysts Journal*, January/February 2003, pp. 17-23.

<sup>33</sup> Thaler, Richard. *Advances in Behavioral Finance*. New York: Russell Sage Foundation, 1993.

<sup>34</sup> Statman, Meir. "What Do Investors Want?" *The Journal of Portfolio Management*, 30th Anniversary Issue, pp. 153-161.

<sup>35</sup> Sharpe, W., D. G. Goldstein, and P. W. Blythe. "Distribution Builder: A Tool for Inferring Investor Preferences." October 2000. Available at <http://www.stanford.edu/~wfsarpe/art/qpaper/qpaper.html>.

<sup>36</sup> Sharpe, W. "Individual Risk and Return Preferences: A Preliminary Survey." 2001. Available at <http://www.stanford.edu/~wfsarpe/art/rrsurvey/vienna2001.htm>

Important Note: This paper contains information on wealth management principles and is for informational purposes only. It should not be construed as investment advice and does not imply an endorsement by Merrill Lynch. In particular, this presentation is not intended as a recommendation that any investor pursue investment strategies involving listed options, high-yield bonds or alternative investments.