CHAPTER 1

# A Brief History of Asset Allocation



For most investors, asset allocation and its meaning seems relatively straightforward, that is, the process of allocating assets. It is the how and the why of asset allocation that has led to an entire asset management industry dedicated to its operation. Given the amount of resources and effort dedicated to understanding asset allocation, it would be reasonable to expect that after almost 5,000 years of human history there would be a suitable solution. The fact that the investment management industry is still groping for an answer is illustrated in the millions of references to "asset allocation" from any Internet search and the fact that there are enough practitioner books and academic articles on "how to allocate assets" to fill any investor's library. This chapter provides a brief history of how major advances in financial theory and investment practice affected investors' approach to asset allocation and how asset allocation has had to evolve to meet changes in economic, regulatory, and technological environments. However, given the range of current and past efforts to diagnose, describe, and prescribe the process of asset allocation, it seems relatively futile to provide any reasonable summary of how we got here, much less what "here" is.

Before reviewing how we have arrived at current approaches to asset allocation, a brief review of what asset allocation is seems appropriate. Simply put, the ability to estimate what the future returns and risks of a range of investors' acceptable investments are and to choose a course of action based upon those alternatives is at the heart of asset allocation. As a result, much of asset allocation is centered on the quantitative tools or approaches used to estimate the probabilities of what may happen (risk) and the alternative approaches to managing that risk (risk management). While the concept of risk is multi-dimensional—including various types of market risks as well as liquidity risk, operational risk, legal risk, counterparty risk, and so on—for many it is simply the probability of a bad outcome. There is simply no single approach to asset allocation that covers all individuals' sense of risk tolerance or even what risk is. In the world of asset allocation, we generally concentrate on the concept of statistically driven risk management since those risk measurements are often centered on statistical estimates of probability (which is measurable) rather than on the concept of uncertainty (or possibility management), on which our empirically driven asset allocation models have little to say.

As a consequence, there is risk or uncertainty even in the most basic concept of asset allocation. Much of what we do in asset allocation is based on the tradeoffs between the risks and returns of various investable assets as well as the risks and returns of various aspects of asset allocation, including alternative approaches to return and risk estimation. Choosing among the various courses of action lies at the heart of a wide range of asset allocation approaches, including:

- Strategic asset management (allocation across various investment classes with the goal of achieving a desired long-term risk exposure)
- Tactical asset management (allocation within or across investment classes with the goal of maximizing the portfolio's short-term return-risk profile)
- Dynamic asset management (systematic changes in allocation across assets with the goal of fundamentally changing the portfolio's risk exposure in a predetermined way)

Asset allocation is not about solely maximizing expected return. It is a central thesis of this book as well as years of academic theory and investment practice that expected return is a function of the risks taken and that those risks may not be able to be measured or managed solely through systematic algorithmic based risk management. Thus, asset allocation must focus on risk management in a broader context, including the benefit of an individual asset allocators's discretionary oversight in order to provide a suitable return to risk tradeoff consistent with an investor's risk tolerance or investment goals. The story of the evolution of our understanding of that return to risk tradeoff is the subject of this chapter. It is important to emphasize the "evolution" part as our understanding of the expected return to risk relationship keeps changing. First, because through time we learn more about how individuals react to risk and second, because the world itself changes (the financial world included).[1]

An individual's or institution's approach to asset allocation depends of course in part on their relative understanding of the alternative approaches and the underlying risks and returns of each. For the most part, this book does not attempt to depict the results of the most current research on various approaches to asset allocation. In many cases, that research has not undergone a full review or critical analysis and is often based solely on algorithmic based model building. Also, many individuals are simply not aware of or at ease with this current research since their investment background is often rooted in traditional investment books in which much of this "current research" is not included.[2]

## IN THE BEGINNING

It should be of no surprise to investors that the two fundamental directives of asset allocation: (1) estimate what may happen and (2) choose a course of action based on those estimates have been at the core of practitioner and academic debate. For our purposes, the timeline of that debate is illustrated in Exhibit 1.1. The advent of Modern Portfolio Theory and practice is often linked to the publication of Harry Markowitz's 1952 article "Portfolio Selection." For many the very words "Modern Portfolio Theory" are synonymous with Markowitz. It is important to point out that Modern Portfolio Theory is now almost 60 years old. As such, and not merely as a result of age, MPT (Modern Portfolio Theory) is really IPT (Initial Portfolio Theory) or OPT (Old Portfolio Theory). Moreover, the fundamental concept expressed in Markowitz's article (the ability to manage risk based on the expected correlation relationships between assets) was well known by practitioners at the time of its publication.

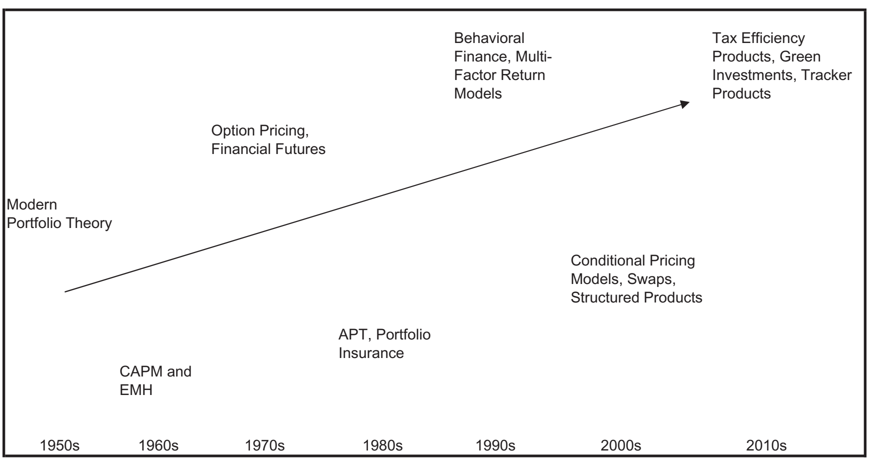


**EXHIBIT 1.1** Timeline of Financial Advances in Asset Allocation

Markowitz formalized the return and risk relationship between securities in what is known today as the mathematics of diversification. If expected single-period returns and standard deviations of available securities as well as the correlations among them are estimated, then the standard deviation and the expected return of any portfolio consisting of those securities can be calculated. This means that portfolios can be constructed with desirable standard deviation and expected return profiles. One particular set of such portfolios is the so-called mean-variance efficient portfolios, which have the highest expected rate of return for a given level of risk (variance). The collection of such portfolios for various levels of variance leads to the mean-variance efficient frontier.[3] In the mid 1950s, James Tobin (1958) expanded on Markowitz's work by adding a risk-free asset to the analysis.[4] This brought into focus an individual's ability to hold only two types of assets (risky and riskless) and to lend or borrow such that those two assets provided the tools necessary to match a wide range of investor return and risk preferences.[5]

The next major advancement in asset allocation expanded the work of Markowitz and Tobin into a general equilibrium model of risk and return. In this work, academics treated volatility and expected return as proxies for risk and reward. In the early 1960s, academics (Sharpe, 1964) proposed a theoretical relationship between expected return and risk based on a set of assumptions of individual behavior and market conditions. These author(s) proposed that if investors invested in the mean-variance efficient market portfolio, then the required rate of return of an individual security would be directly related to its marginal contribution to the volatility of that mean-variance efficient market portfolio; that is, the risk of a security (and therefore its expected return) could not be determined while ignoring its role in a diversified portfolio.

## A REVIEW OF THE CAPITAL ASSET PRICING MODEL

The model developed by Sharpe and others is known as the Capital Asset Pricing Model (CAPM). While the results of this model are based on several unrealistic assumptions, it has dominated the world of finance and asset allocation for the past 40 years. The main foundation of the CAPM is that regardless of their risk-return preference, all investors can create desirable mean-variance efficient portfolios by combining two portfolios/assets: One is a unique, highly diversified, mean-variance efficient portfolio (market portfolio) and the other is the riskless asset. By combining these two investments, investors should be able to create mean-variance efficient portfolios that match their risk preferences. The combination of the riskless asset and the market portfolio (the Capital Market Line [CML] as shown in Exhibit 1.2) provides a solution to the asset allocation problem in a very simple and intuitive manner: Just combine the market portfolio with riskless asset and you will create a portfolio that has optimal risk-return properties.

In such a world, the risk of an individual security is then measured by its marginal contribution to the volatility (risk) of the market portfolio. This leads to the so-called CAPM:

$$E(R_i) - R_f = [E(R_m) - R_f]\beta_i$$

$$\beta_i = Corr(R_i, R_m) \times \frac{\sigma_i}{\sigma_m}$$

where

$R_f$ = Return on the riskless asset

$E(R_m)$ and $E(R_i)$ = Expected returns on the market portfolio and a security

$\sigma_m$ and $\sigma_i$ = Standard deviations of the market portfolio and the security

$Corr(R_i,R_m)$ = Correlation between the market portfolio and the security

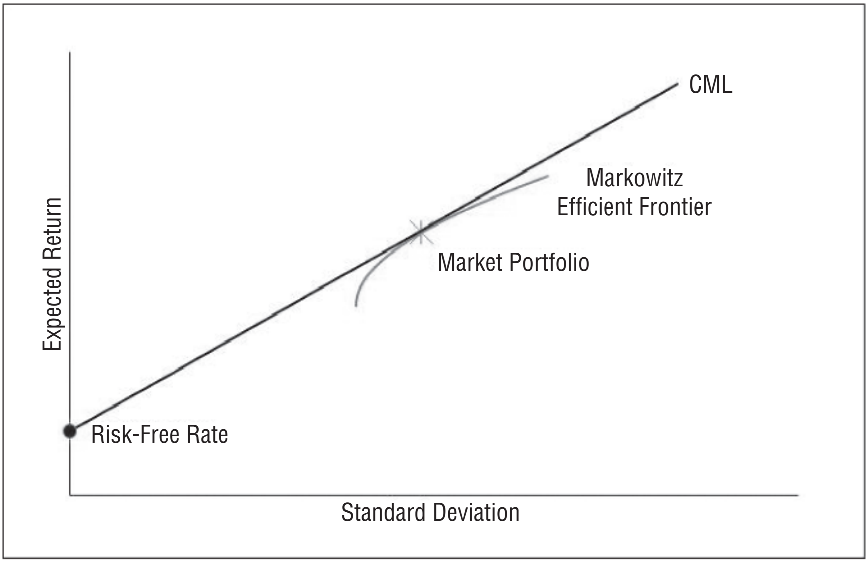


**EXHIBIT 1.2** Capital Market Line

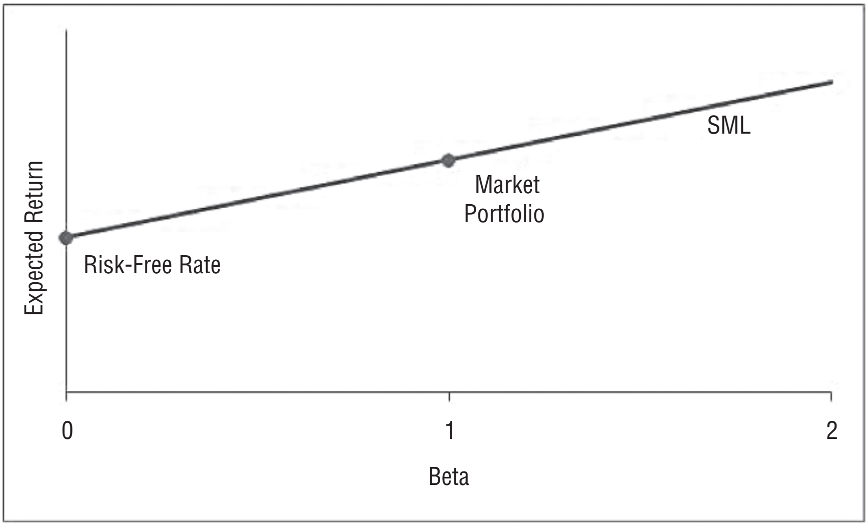


**EXHIBIT 1.3** Security Market Line

Thus, in the world of the CAPM all the assets are theoretically located on the same straight line that passes through the point representing the market portfolio with beta equal to 1. That line is called the Security Market Line (SML), as shown in Exhibit 1.3. The basic difference between the CML and the SML is one of reference system. In the CML the risk measured is total risk (standard deviation), while the risk measured in the SML is a security's marginal risk to the market portfolio (beta).

While the most basic messages of MPT and CAPM (that diversification is important and that risk has to be measured in the context of an asset's marginal contribution to the risk of reference market portfolio) are valid and accepted widely by both academics and practitioners, many of their specific recommendations and predictions are not yet fully accepted and in some cases have been rejected by empirical evidence.[6] For instance, observed security returns are very weakly, if at all, related to a security's beta, and most investors find a simple combination of the market portfolio and the riskless asset totally inadequate in meeting their risk-return requirements.

## ASSET PRICING IN CASH AND DERIVATIVE MARKETS

### CAPM and EMH

As discussed in greater detail later in this book, the CAPM profoundly shaped how asset allocation within and across asset classes was first conducted. Individual assets could be priced using a limited set of parameters. Securities could be grouped by their common market sensitivity into different risk classes and evaluated accordingly; and, to the degree that an expected market risk premia could be modeled, it would also be possible (if desired) to adjust the underlying risk or beta of a portfolio to take advantage of changes in expected market risk premia (i.e., increase the beta of the portfolio if expected market risk premia is high and reduce the beta of the portfolio if the expected market risk premia is low). Here, market risk premia is defined as the difference between the expected rate of return of the market portfolio and the "riskless rate of interest."

While the CAPM is at its heart a model of expected return determination, it quickly became the basis for a number of asset allocation based decision models. The rudimentary nature of computers in the early 1960s is often forgotten and, while the mathematics of the Markowitz portfolio optimization model were well known, the practical application was limited due primarily to the number of numerical calculations. Specifically, the amount of data needed to obtain reasonable estimates of the covariance matrix is significant. For instance, if we have 100 securities, then to estimate the covariance matrix, we would need to estimate 100 variances and $(100^2 - 100)/2$ covariances, which add up to 5,050 parameters, have to be estimated. This would be computationally difficult and would have required many hours of work. As an alternative, the number of calculations can be significantly reduced if it is assumed that returns are driven by only one factor (e.g., the market portfolio). Note that this does not assume that CAPM holds. In other words, suppose we use a simple linear regression to estimate the beta of an asset with respect to a well diversified portfolio.

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}$$

The rate of return on the asset at time $t$ is given by $R_{it}$, the rate of return on the diversified portfolio is given by $R_{mt}$, the intercept and the slope (beta) are given by $\alpha_i$ and $\beta_i$ respectively. Finally, the error term for asset $i$ is given by $e_{it}$. Suppose we run the same regression for another asset, denoted asset $j$. If the error term for asset $j$ is uncorrelated with the error term for asset $i$, then the covariance between the two assets is given by

$$Cov(R_i, R_j) = \beta_i \beta_j Var(R_m)$$

Notice that to estimate covariance between the two assets, we need an estimate of the variance of the market portfolio as well ($Var(R_m)$). However, this term will be common to all estimates of covariance. The result is that the number calculations required to estimate covariance matrix is now reduced to $(2 \times 100 + 1)$.

It is important to note that the above regression model, known as the market model, has nothing to do with the CAPM. The above regression makes no prediction about the size or the sign of intercept. It simply a statistical relationship used to estimate the beta. On the other hand, the CAPM predicts that the market model intercept will be $(1 - \beta_i)R_f$.

It is fair to say, however, that almost 40 years ago most academics and professionals knew that the CAPM was an "incomplete" model of expected return. We now know that Sharpe and his fellow academics had unwittingly created a sort of "Asset Pricing Vampire," which rose from their model and, despite 30 years of stakes driven into its heart lives to this day for many practitioners as the primary approach to return estimation.[7] In the early years of the CAPM, financial economists were like kids with a new hammer in which everything in the financial world looked like a nail. For example, if an asset's expected return can be estimated, then that estimate could be used as a basis for determining if an individual could consistently choose assets that were fundamentally underpriced and offered an ex post return greater than that consistent with its underlying risk. In sum, it provided the basis for determining if managers could obtain an alpha (excess return above that consistent with the expected return of a similar risk-passive investable asset).

The combination of the full information assumptions in the CAPM, along with the "presumed" ability to measure expected returns consistent with risk, offered academics the chance to measure the true informational efficiency of the marketplace. Initial studies by academics indicated that active managers underperformed similar risk passive indices. This empirical result helped give rise later to the creation of a series of passive non-investable and investable indices that would form the basis for the asset allocation consulting industry. As important, the combination of presumed informational efficiency with the ability to measure expected return led to the development of the Efficient Market Hypothesis (Fama, 1970) in which assets' prices were described relative to the degree to which their current prices reflected various types of information; that is, an asset's current price may be consistent with (1) past price information (weak form efficiency); (2) public information (semi-strong efficiency); and (3) private information (strong form efficiency). If market inefficiencies existed, this implied that investors could earn returns that would exceed what is predicted by the asset's underlying risk as if there were some violation of information efficiency (similar to a monopoly or oligopolies). However, if the Efficient Market Hypothesis (EMH) is true, most investors should not waste their time trying to pick individual stocks using well-known public information but concentrate on risk determination and the proper set of assets to capture the expected risk that matches their risk preferences.

Today it is realized that the Efficient Market Hypothesis would be more correctly named the "Excess Return if We Only Knew How To Measure Expected Return Hypothesis"; it did provide the impetus for moving from a "Managers Only Matter" state of mind to an asset allocation process based on "Managers May Matter But Let Us Measure It First" plus a "Passive Approach to Asset Class/Security Selection." Again, it is important to come to terms with what the EMH says and does not say. EMH does not say that prices fluctuate randomly. EMH states that prices randomly fluctuate with a drift; that is, tomorrow's expected price is equal to today's price times the asset's expected return where expected return is based on current information (risk assessment). EMH says that there are no free lunches. Such profit opportunities are quickly eliminated, and the only way one can earn a high rate of return is through assuming a higher level of risk.

The quintessential problem is that there is no firm understanding of how people determine expected risk-adjusted return since there are no conclusive models that demonstrate how people price risk. All we can say is whether a manager has been able to create excess return (return above some arbitrary chosen expected return model). The EMH does not say that an investment manager cannot make a gross return in excess of a passive approach. The EMH only says that if a manager makes such an excess return (e.g., because of access to technology or information), the investor may be charged a fee equal to the excess return such that the net return will be similar to that of investment in the passive index (e.g., manager returns – manager fee ≥ return on passive index). The manager's fee is supposed to cover the cost of acquiring the technology and/or information plus the investment made in time and effort to use that technology and information.

The combination of the CAPM and the EMH gave the market place the twin academic pillars required for the development of the asset allocation industry. All that was needed was a third pillar, a business model capable of developing the infrastructure required to market this new industry. Fortunately, computers and information technology had advanced such that in the late 1960s the investment industry witnessed the expansion of the index business. Both within the United States and overseas, monthly and even daily data series of domestic and global stock indices were being created. These indices could be used to provide estimates of the benefits of various approaches to asset allocation. For instance, newly developed global stock indices were used in a number of studies to illustrate the potential benefits of combining domestic stock indices (asset classes) with foreign and international stock indices (Grubel, 1968; Levy and Sarnet, 1970).[8]

Lost, of course, in this academic and practitioner euphoria were some of the practical realities relating to the underlying assumptions of the CAPM and EMH. First, the available empirical evidence had not strictly supported the CAPM's expected return and risk relationship. There was no means to estimate the "True Market Portfolio," so any empirically estimated betas were only estimates subject to unknown measurement errors. More complex multi-factor models were required to capture expected return processes. While the market for financial products aimed at providing such multi-factor models came into existence (e.g., Barr Rosenberg and Barr's better betas), most academics remained wedded to single-factor models. As academics came to appreciate the statistical problems associated with using underspecified single factor (beta) models of return determination or the data problems associated with the use of international data (e.g., timing of data or liquidity), attempts were made to "tweak" the CAPM. Throughout the 1970s, various forms of zero beta and multi-beta APT models came into existence—better to explain the previously unexplained residual error of the single factor models of return estimation. These models provided additional statistical tools for measuring the efficacy of the EMH.

As with most people, when given the choice between the familiar and the unfamiliar, academics and practitioners kept using the hammers they had (CAPM and EMH) to nail down the problem of expected return estimation and the degree to which individual managers provided returns in excess of similar risk passively produced portfolio returns. In truth, the CAPM and EMH models did an excellent job of describing most market conditions. For the most part, markets do work. It should be expected that for financial markets with low-cost information (e.g., Treasury Bill market), asset prices would reflect current information and a common risk based return model. Other markets and/or assets may require enlarged risk based factor models that capture an enlarged set of underlying risks and therefore expected returns. Small firms with few analysts following them, with less ability to raise capital, with a less diversified client base, limited legal support, and so on may be priced to reflect those risks. Many assets are simply not tradable or have high transaction costs (e.g., housing, commodities, employment contracts, or distressed debt). How they could or should be priced in a single-factor or even a multi-factor model framework was explored, but a solution was rarely found.[9]

### Option Pricing Models and Growth of Futures Markets

We have spent a great deal of time focusing on the equity markets. During this period of market innovation, considerable research also centered on direct arbitrage relationships. Arbitrage relationships in capital and corporate markets were explored during the 1930s (forward interest rates implied in yield curve models)[10] and in the 1950s (corporate dividend policy and debt policy). Similarly, cost of carry arbitrage models had long been the focal point of pricing in most futures based research. In the early 1970s Fischer Black and Myron Scholes (1973) and Merton (1973) developed a simple-to-use option pricing model based in part on arbitrage relationships between investment vehicles. Soon after, fundamental arbitrage between the relative prices of a put option (the right to sell) and a call option (the right to buy) formed a process to become known as the Put-Call Parity Model, which provided a means to explain easily the various ways options can be used to modify the underlying risk characteristics of existing portfolios. Exchange based trading floors soon came into existence, which helped eventually to develop a market for a wide range of option based financial derivatives. While a range of dynamic futures based approaches should provide similar risk management opportunities, options provided a direct and easily measured approach to fundamentally change the risk composition of an asset or a portfolio. As important, the model allowed one to estimate the cost for modifying the risk of a portfolio.

The growth of options as a means to provide risk management was centered primarily on equity markets. The 1970s also witnessed the creation and growth of new forms of financial futures, including currency futures in the early part of that decade and various forms of fixed income futures in the latter half (Treasury Bond futures). The creation of the Commodity Futures Trading Commission (CFTC) in the mid 1970s provided the additional government oversight necessary for the growth and development of new forms of financial futures as well as options products based on them. It is well known that futures provide a means to directly track underlying investment markets as well as to provide risk reduction opportunities. Futures contracts offer the ability to reduce or increase the underlying variability of an asset but futures alone do not permit one to fundamentally change the risk structure of the asset. The ability to directly change the distributional form of an asset is left for options. It can simply be said that the creation and development of options and futures trading in the 1970s led the way for the creation of an entire new industry dedicated to new means of managing risk.

## MODELS OF RETURN AND RISK POST-1980

Models of investors' behavior as well as models of return and risk relationships, like so much of modern finance as well as life, are evolutionary. Given the tools and information at hand, various theories of expected return and risk relationships were put forth and were tested against the available data and technology of the period. Whether realized or not, none of the theories presented offered stopping points. They were in fact evolutionary steps with each reaching a conclusion within the confines of their stated parameters. As noted above, the EMH only states that expected return is a function of expected risk, which is a function of expected information. Nothing says that individuals do not get it wrong ex post or even that they had it right ex ante. In any market there is a process of information discovery and market reaction. The fact that, on average, individuals do not correctly value factors such as ratings or real estate payment cycles is less a critique of market efficiency than the process by which individuals assess information. Whatever the criticisms of the EMH, it became a staple of the investment jargon along with the CAPM as the benchmarks by which products were designed or marketed. Even other markets and products were discussed in terms of their performance or risk attributes relative to EMH or CAPM. For example, in the early 1970s the benefits of commodity futures were even discussed in terms of their equity market betas (Dusak, 1973). Fixed income securities (while developing their own multi-factor jargon such as duration and convexity) were also discussed with regard to offering expected returns in terms of their betas with some weighted stock and bond market portfolio.

By the early 1980s a range of financial products and databases had come into existence that provided the ability to empirically test asset allocation decision rules (Ibbotson and Sinquefield, 1979). Options trading had grown and financial futures markets had evolved (S&P 500 futures contracts came into existence in the mid 1980s). Other changes had taken place in terms of technology, regulation, and market structure to provide an enhanced set of conditions that supported further development of asset allocation within a risk-controlled environment. During this period, systemized approaches to tactical asset allocation were being developed and marketed. By the mid 1980s concepts such as alpha transfer (Schwarz et al., 1986) and dynamic portfolio insurance (Leland, 1988) were well understood. In addition, during the 1980s advances in computer technology and software (e.g., Lindo) made available for the first time a series of self-serve portfolio management tools that enabled investors the ability to directly manage and adjust portfolio risk exposure.

It is fair to say that throughout the 1980s and 1990s markets continued to expand, which provided additional investable products that further expanded the available investable set. As technology advanced and markets expanded, the ability to dissect and reset asset flows led to the development of a wide range of new structured products and investment vehicles designed to meet the unique return and risk profile of individual investors. Financial regulation made it profitable for banks to offload certain trading processes, and new forms of external product based hedge funds and managed futures programs were developed. By the mid 1990s, globalization had led to the development of new forms of emerging market securities, new commodity products, as well as new forms of non-exchange traded financial products such as swaps to manage investor unique risks not fulfilled by more general exchange based products. The development of these non-exchange traded products culminated in the growth of various fixed income products (e.g., credit default swaps), which helped manage not only the exposure to interest rates but also the credit risk as well.

The evolution, if not revolution, in the market structure and trading also impacted the way practitioners and academics viewed the asset pricing process. Concerns over the deviations from the strict CAPM process led to new research focused on issues that have been expanded under the topic "behavioral economics," which offers for some a more plausible picture of investor behavior. As these alternative models became popular, alternative views as to the underlying process by which excess return was determined evolved. Fama and French (1992, 1995) and others developed a series of empirical models that indicated that sources of returns could be related to firm size as well as style (growth and value).

Although behavioral economics and other expanded models of return to risk models dominated the market, the challenge remained on how to hang on to the baby as the bathwater is thrown out. The development of more behavioral approaches to risk and return determination did focus on a more activist approach to asset price determination and the fact that the process of price determination is not instantaneous.[11] Arguments about the benefit of such behavioral approaches to asset pricing in some cases missed the point. EMH does not say that there are no risk free $100 bills lying on the street, rather it states that there are unforeseen risks in attempting to pick them up. Moreover, the fact that there exist "irrational investors" may have little impact on market prices. The current price is always only a clearing price. There are other individuals who will pay more but do not have to and others who would sell it for less but do not have to. The market price mostly reflects those with the most money and does not generally reflect small rational or irrational investors who for the most part are price takers. Also, people may behave predictably when faced with simple choices in a psychology lab, but when faced with extreme amounts of money, especially in arbitrage markets, it is rare that ex ante market prices do not reflect the best of the brightest; there is just too much money to make or lose.[12]

## ASSET ALLOCATION IN THE MODERN WORLD

Looking back over the past decade, the issues in asset allocation had less to do with the theoretical models underlying return determination than the changes in market and trading structures that have led to a rapid increase in the number of available investable alternatives. Today, the number of investment choices has expanded beyond that available in traditional stock and bond investment to a wider range of alternative investments, including traditional alternatives such as private equity, real estate, and commodities, as well as more modern alternatives such as hedge funds and managed futures. In the past 10 years, academics and practitioners have also come to appreciate that both traditional stocks and bonds as well as alternatives (real estate, commodities, private equity, hedge funds, and managed futures) have common risk factors that drive returns and that those risk factors are conditional on changing market conditions. Moreover, global and domestic regulatory forces as well as market forces have created a new list of investable products (exchange traded and over the counter). These products include more liquid and readily available forms of traditional stock and bond investment (e.g., ETFs, OTC forward and options contracts) as well as more liquid and readily investable alternative investment forms (e.g., passive investable benchmark products).

The addition of new investment forms has permitted individuals to more readily access previously illiquid or less transparent asset classes (e.g., private equity or real estate) and has increased the number of assets that provide the potential for risk diversification in various states of the world. In fact, risk itself has become a more tradable asset. While options had always provided a means for individuals to directly manage risk, previous attempts to directly trade risk had not met with success. In the mid 2000s, various forms of VIX (VIX is the ticker symbol for the CBOE Volatility Index) began to be traded directly on central exchanges. In addition, advances in various forms of structuring along with algorithmic based trading products have offered investors a broader set of domestic and international vehicles by which to manage asset portfolios. Lastly, the development of the Internet, along with the expansion of data and product availability as well as computer technology have permitted the development of a wide set of new approaches to asset allocation and risk management.

The problem still exists that we do not know what we can reasonably expect from these new products as well as the various asset allocation systems. Investor asset choices exist under a wide range of investment constraints. Regulation prevents some individuals from investing in certain forms of asset classes except in the most rudimentary form. Investment size restricts certain investors from taking advantage of more cost efficient asset classes (e.g., swaps may be the preferred form of accessing a particular asset class but many investors are limited to investing in exchange traded variants, which do not have the same statistical properties). As pointed out, the market is never efficient for everyone; that is, transaction costs differ, borrowing costs differ, taxation differs such that the actual after-tax return for individuals and institutions varies greatly. Finally, the ability to process and understand information and its consequences differs.

The very unpredictable nature of risky asset pricing raises the issue of how best to manage that risk. Certainly, the Markowitz model based on estimates obtained from historical figures continues as a primary means by which individuals attempt to estimate portfolio risk; however, the 2007 and 2008 market collapse illustrated the fundamental flaw of the Markowitz diversification approach; that is, Murphy's Law of Diversification—assets and markets only offer diversification benefits when you do not need them.

Until recently, investors felt secure that they had available to themselves not only a wide range of potential assets to invest in but also a wide range of risk management tools to manage that risk. It is not that investors are unaware of the potential issues in risk management. While many practitioners continued to concentrate on return maximization, many academics focused on the conditional risk, and, therefore, changing return to risk properties of various investments. Portfolio rebalancing based on the conditional nature of risk appeared to offer a more consistent approach to managing a portfolio's risk. However, even these models were incapable of anticipating the risk exposures of typical portfolios under extreme economic conditions witnessed in 2008. The market collapse of 2007 and 2008 provided conclusive evidence that while risk could be understood and in certain cases even managed, it could not be eliminated. The real problem remained now among market participants—what is risk and how to manage it?

## PRODUCT DEVELOPMENT: YESTERDAY, TODAY, AND TOMORROW

The touchstone of evolution is that an entity has to develop to survive within its environment. Understand that the operative word is survive, and survival does not carry an optimization requirement. So we will not find the perfect theory or grouping of products as change comes to the corporate or investment world or, for that matter, to academic research. Rather, we will find that we have a better understanding of risk and return relationships. Today's growth in off-exchange and screen-traded markets, in contrast to floor-traded markets, is only one example of such understanding and change. There can be, however, a gulf between reality and perception. A delay in an investor's (and here the term is used broadly to incorporate regulators and corporate boards) understanding or market awareness of new research or market relationships often results in a delay in an appreciation of these changes and leads to a significant disadvantage in the marketplace.

Change comes from many sources. Modern investment products grew out of economic necessity, regulation, and technological innovations. Currency derivatives came into existence out of the failure of the United States to manage its own currency; thus the market had to devise an approach to facilitate international trade in a world of uncertain currency values. Individual options grew in the early 1970s as risk management tools, partly in response to the collapse of the stock markets of the late 1960s and the demand for new means of equity risk management. In the 1980s the expansion of interest rate futures and the development of equity futures followed, in part, from earlier ERISA laws, which created the pension fund asset base that required investment managers to hedge their asset risks. During the 1990s and into the current era, new product creations (e.g., swaps) were part of the changing world of technology and the resulting increasing ability to manage and monitor an ever more complex series of financial and nonfinancial products.

Thus, while we know very few fundamental truths, one, however, that we can collectively agree upon is that the evolution of asset allocation draws upon the aforementioned changes flowing from a dynamic world in which new forms of assets and risk management tools are constantly being created. Relative risks and returns and the ability to monitor and manage the process by which these evolving assets fit into portfolios will change and will be based on currently unknown relationships and information. Certainly today the challenge is greater, not only because we are working in a more dynamic market but the number of investment vehicles available to investors has increased as well. Hopefully, the following chapters will provide some guidance to meet this challenge.

## WHAT EVERY INVESTOR SHOULD REMEMBER

- Much of what we do in asset allocation is based on the tradeoffs between the costs and returns of various approaches to return and risk estimation. Choosing among the various courses of action based on those risky alternatives lies at the heart of a wide range of various approaches to asset allocation, including strategic asset management, tactical asset management, and dynamic asset management.

- MPT (Modern Portfolio Theory) is really IPT (Initial Portfolio Theory) or OPT (Old Portfolio Theory). The CAPM and Efficient Market Hypothesis, as well as more modern multi-factor risk approaches to asset pricing, while providing a basic framework for addressing return and risk dynamics in the marketplace, are in most cases 60, 40, 30, or 20 years old. In short, the sources of asset returns and risks are known to be more dynamic than currently considered in the most basic asset allocation models such that a more nuanced and in some cases discretionary approach of the return and risk process must be considered when viewing the asset allocation process.
- The continued evolution of market structure, regulatory oversight, and trading technology has produced an increasing number of investable products as well as the means to monitor those products' interactions. Asset allocation is more than a simple breakdown of investment alternatives into stocks and bonds and now includes a broader range of traditional alternatives (private equity, real estate, and commodities) along with new alternatives such as hedge funds and managed futures. In addition, the ability to provide a greater number of unique targeted products designed to meet investors' needs has increased the asset allocation choices to investors.

## NOTES

1. One of the least emphasized parts of asset allocation is that an asset's marginal risks to a market portfolio may change when assets that were once noninvestable are added to the investable pool, since the marginal risks change when the composition of the investable portfolio changes.
2. Most current investment textbooks (Bodie, Kane, and Marcus 2008; Reilly and Brown 2008) provide an excellent review of basic investment concepts, but for the most part they do not deal in great depth with the wide range of asset alternatives available to investors or with the range of alternative approaches to return and risk estimation. As discussed earlier, a book (including this one) published in 2010 was often written two years earlier (2008) using research material published in 2006, which was written in 2004 based on data from an even earlier period. In short, basic textbooks often emphasize material that is 6 to 10 years old.
3. By the 1950s, other economic concepts such as the existence of pure securities were also commonplace (Arrow and Debreu 1954).

4. An example of the continued debate as to the development of asset pricing is the debate as to whether the MPT and the CAPM are positive or normative in construction. The author(s) will leave it up to the readers to decide. As to the basis for positive and normative models, see Milton Friedman (1953), *Essays in Positive Economics*, University of Chicago Press. Note that Friedman gave proper credit to John Maynard Keynes. Friedman starts his introduction by pointing out that "In his admirable book on *The Scope and Method of Political Economy* John Neville Keynes distinguishes among '*a positive science* ... a body of systematized knowledge concerning what is; a *normative* or *regulative science* ..., a body of systematized knowledge discussing criteria of what ought to be.' "
5. This concept was later expanded with the growth of the capital asset pricing theory and the development of the capital market line in which the investment choice was really between two assets (the risk-free asset and the tangent risky portfolio).
6. The initial tests indicated that while the empirical return to risk relationships derived from the CAPM were superior to similar single-factor volatility based models, the residual error (unexplained return volatility) was so large as to question whether the underlying CAPM fit practice. The decade following the CAPM's introduction saw numerous articles (Roll, 1978) that detailed the problems with empirically testing the CAPM, which—while not denying the significant contributions of the CAPM—did imply that a more complete and dynamic process of risk estimation and return determination would more adequately describe the expected return and risk tradeoff.
7. For example, the Sharpe Ratio, defined as:

$$S_i = \frac{\left(\bar{R}_i - R_f\right)}{\sigma_i}$$

   was meant to provide evidence of the relative benefit of two efficient risky portfolios on the capital market line and became the performance measurement vehicle of choice. Note that the Sharpe Ratio for an individual asset or portfolio merely provides evidence of the number of standard deviations the mean return of a portfolio/asset is from the risk-free rate.
8. It is hard to remember the importance of the initial studies which demonstrated the return to risk benefits of international investment. However the studies failed to emphasize the point that if the two international financial markets were separated to any great detail, the historical risk relationships may not tell us much about the expected return to risk relationships after the two countries became integrated (e.g., new market portfolio). The implications of that simple point—that as markets evolve, historical return to risk relationships may also evolve—has remained a problem for most asset allocation practitioners.
9. While lost to history, in the early 1970s the University of California at Berkeley held a series of seminars discussing the problem of tradable and nontradable assets in a market portfolio context.

10. Research in the 1930s also addressed the ability to manage investment horizon risk in fixed income through the use of duration based modeling. In addition, at the same time that Markowitz was publishing his views on MPT, Frank Redington (1952) was conducting research on how to best manage the risk of bond funds (duration).
11. While a summary of empirical tests of various equity based pricing models is not the focus of this book, the changing market structure and risk and return opportunities are. Just as the CAPM and its empirical variant (e.g., the market model) became a primary expected factor model for decades, the Fama and French three-factor model plus one (momentum) has somewhat dominated the academic world for the past 20 years, despite evidence that the underlying factors may have become less important in terms of explaining return. Thomas Kuhn (*The Structure of Scientific Revolutions*, 2nd ed. 1970) offers one explanation as to why the movement from one mode of explaining market returns to another is so difficult. The point is simple: there is risk in the use of any risk or return model.
12. One can always take this to various extremes. The fact that over time return to risk is correctly priced does not mean that at some point assets may offer known excess to risk opportunities for which others take the anticipated loss (e.g., government policy may force losses on some for the benefit of others); however, this is simply another risk that must be considered when investing. Some markets are more prone to mispricing than others. Fortunately, the markets that are most prone to mispricing are so small in valuation that they have little impact on global valuation, although they make interesting television.