

Fundamentals of Asset Allocation

Commonwealth of Massachusetts
Public Employee Retirement Administration Commission



Commonwealth of Massachusetts

Public Employee Retirement Administration Commission

Robert E. Tierney, *Chairman* | A. Joseph DeNucci, *Vice Chairman*

C. Christopher Alberti | Stephen P. Crosby | Kenneth J. Donnelly | James M. Machado | Donald R. Marquis

Joseph E. Connarton, *Executive Director*

5 Middlesex Avenue, Third Floor, Somerville, MA 02145

ph 617 666 4446 | fax 617 628 4002 | tty 617 591 8917 | web www.mass.gov/perac

Published by PERAC, 2002. Printed on recycled paper.

Fundamentals of Asset Allocation

Robert A. Dennis, C.F.A., *PERAC Investment Director*

Investment Director's Letter

The Fundamentals of Asset Allocation is presented as a framework for many of the important decisions a retirement board must face in constructing its investment portfolio.

Diversification is the key to avoiding highly erratic investment performance and to having consistent returns over time. The report describes how the classification of investments goes well beyond just stocks and bonds and explains that a well-diversified portfolio should have reasonable exposure to all investment styles and subclasses.

The report describes the major characteristics, including historical returns and the measurement of risk, of the various asset classes and explains how expected returns and risk, along with the concepts of correlation and optimization, are utilized to construct "efficient portfolios".

Some of the problems and controversies about asset allocation are also covered, including whether international investing remains an attractive asset class in light of recent trends toward globalization.

Besides discussing rebalancing and other practical issues, the report concludes by presenting the actual composite asset allocation of the PERAC retirement systems along with that of other major public and private pension funds.

The PERAC Investment Unit welcomes any comments you have on this report and encourages retirement boards to contact us at any time with inquiries on asset allocation or any related investment topic.


Robert A. Dennis
PERAC Investment Director

“Don’t put all your eggs in one basket.”

That timeless proverb not only carries an important message for many aspects of everyday life but is also the guiding principle behind a successful long-term investment program.

Indeed, the most important determinant behind success or failure in investment management is not individual security selection or trading. Research shows that about 90% of the variance in a portfolio’s investment returns over time is explained by asset allocation, the process of determining the percentage of portfolio assets allocated to specific asset classes such as stocks, bonds, real estate, venture capital, et al. Asset allocation has its intellectual roots in the 1950s when economist Harry Markowitz, who was later awarded the Nobel Prize for his work, began developing what became known as modern portfolio theory.

The goal of asset allocation is to maximize returns at a prudent level of risk or to minimize the risk involved in achieving a certain return. The process of determining the appropriate asset allocation involves an analysis not only of available investment asset classes but also of the liabilities of an entity such as a retirement system. The needs and preferences of the investor are the basic building blocks of an asset allocation.

In the case of a pension fund, board members have the exclusive purpose as fiduciaries to provide benefits for members and survivors through a program of prudent, expert investing. Their responsibility is to develop an investment program where expected returns meet their system’s projected financial liabilities. Retirement board members must be sure their actuarial assumptions are sound, and they must assess the sensitivity of their portfolio to severe market declines and whether the portfolio provides sufficient protection against inflation. The primary goal in constructing a portfolio is that the expected return be sufficient to satisfy an investor’s financial objectives and be commensurate with a level of risk that the investor is comfortable with. There are several asset classes, or groups of investment securities whose behavior is similar in response to changes in economic circumstances, and each class (i.e., stocks) may have several distinct subclasses (large capitalization, midcap, and small cap; growth and value). The major inputs to an asset allocation process are the financial objectives and risk tolerance

Research shows that about 90% of the variance in a portfolio’s investment returns over time is explained by asset allocation.

of the investor as well as the historical and expected returns for each distinct asset class or subclass, the volatility of those returns over time, and the correlation of returns among the asset classes or subclasses.

Risk means different things to different people. To a bungee jumper, it's the possibility that the cord might break. For an investor, risk means the possibility of losing money and not meeting one's financial objectives. Similarly, asset allocation is like wearing protective gear in athletics. A competitor might perform better if not hampered by protective gear, but without it, a blow to an unprotected part of the body could prove disastrous. Someone investing during the late 1990s might have concluded that large cap growth stocks were the only asset class needed for a successful portfolio. It was difficult to invest anywhere but in that momentum-charged subclass during that period, but a prudently constructed portfolio would also have had assets in then under-performing sectors like bonds, small cap stocks, value stocks, and real estate. Holdings in these sectors served as hedges that inhibited maximum performance during that unique period but they would significantly cushion the portfolio when the high-flying growth stocks cooled off, as history and logic told us they inevitably would. Indeed, in March 2000, they began correcting with a cruel vengeance.

It is not unusual for one asset class or investment style to dominate returns for four consecutive years as US large cap growth stocks recently did (1995-98), but other classes—including small caps, international stocks, and real estate—have enjoyed similar extended periods of superior performance over the past quarter century. If we had examined historical returns of large US stocks, small US stocks, international stocks, and high grade US bonds over the twenty years through 1998, there had been only one year prior to 1995 that large stocks provided the best performance among these four asset classes.

An effective portfolio is not just the sum of its parts but should incorporate the expected interaction among those parts. Correlation measures the likelihood that two asset classes will move in the same direction, and selecting asset classes that have as little correlation with each other as possible should reduce risk and volatility in a portfolio while helping to achieve expected returns.

A guiding principle of asset allocation is that a portfolio diversified among asset classes will never match the performance of the best asset class each year but it will also never equal the worst. The late 1990s, during which performance was concentrated in a select group of US stocks, presented a serious challenge to proponents of asset allocation. Nevertheless, beginning with the out-performance of small caps over large caps in 1999 and continuing with the definitive bursting of the "new economy" bubble in 2000, the last few years have proven conclusively and dramatically that there are distinct benefits to diversification among asset classes.

Historic Returns

Historical data from 1926-01 compiled by Ibbotson Associates (a firm well known for its collection and analysis of investment returns) gives the compound annual returns of various classes of domestic stocks and bonds over this period. The average annualized return from stocks has been 10.7% (10.1% for large caps and 11.7% from small caps) and 5.7% from high-grade bonds.

Stocks have indeed been the best performing asset class historically. Over the ten years ending 1998, the out-performance of stocks over bonds had been even greater than the long-term average as the S&P 500 gained 19.2% annually compared to 9.3% for investment grade bonds. Following the stock market's painful yet inevitable correction, however, relative performance appeared to be reverting to normal by the end of 2001 as the 10-year annualized return for the S&P 500 had declined to 12.9% versus 7.2% for bonds.

Returns on stocks are certainly volatile, as annual returns for the S&P 500 have been negative more than one quarter of the time since 1926. Government bonds have actually sustained a similar number of annual losses but the magnitudes of gains and losses have been much smaller than those of stocks. Another cautionary note is that almost one third of the time since 1926, the annual return from blue chip stocks has failed to exceed inflation in that year. Taking account of inflation, the "real" annual return from stocks has been about 8%.

The advantages of stocks are seen over time. Over the 72 overlapping five-year periods from 1926 to 2001, large cap stock returns were positive in all but five of the periods; over the 64 overlapping 10-year periods over this period, large cap stock returns were positive 62 times, and they have been positive for every fifteen-year period over time. Stocks have outperformed bonds 66% of the time over one-year periods but 82% over ten-year periods, 92% of the time over 20-year periods, and 99% of the time over 30-year periods. Since 1926, the 1930s have been the only decade when bonds outperformed stocks. (Over the 76 years through 2001, cash—as measured by 90-day Treasury bills—outperformed both stocks and bonds in eleven of those years.) Thus, the longer an investor's time horizon, the more the portfolio should be biased toward equities. The advantages of equities are even more important after considering taxes. Taxes, of course, are not a factor in pension fund investing but for individuals, capital gains are treated favorably relative to dividends or interest income.

US stocks clearly have a very favorable and impressive long-term return record, but one must be cautious when using either the widely-publicized Ibbotson numbers or any other historic returns as projections for future returns. Of the 57 overlapping 20-year calendar periods since 1926, stocks have returned less than 10% about 40% of the time. More ominously, additional research shows that the

Stocks and bonds have both performed poorly in periods of high inflation and well in periods of low inflation.

best equity market returns were achieved from investments made during periods when the price-to-earnings ratios were generally within the long-term historic average range of 14 to 16. Investments made when P/E ratios were 20 or higher (they were at all-time high of close to 30 near the top of the late 1990s market but are still in the mid 20s today) resulted in typical annual returns of just 5% over the following 10 years. (As explained in the PERAC investment education presentation, “Understanding Investments”, the P/E ratio—a company’s stock price divided by its earnings per share—is one of the most traditional measures of assessing the value of a stock.)

Some other observations about historical returns include the fact that stocks and bonds have both performed poorly in periods of high inflation and well in periods of low inflation. Indeed, inflation is one of the worst enemies of pension funds; during periods of high inflation, pension benefits tend to rise while investment returns are declining. The effect of business cycles is less clear; not every stock market downturn has corresponded with an economic recession and not every recession resulted in poor stock market performance.

Subclasses & Styles

It has become readily apparent in recent years that attention must be paid not only to allocation among major asset classes such as equity and fixed income but also to important subclasses. In equities, one of the most significant choices is between growth and value stocks. Up until the year 2000, there didn’t seem to be much basis for choice as growth had outperformed value for six consecutive years. Since the bursting of the new economy bubble beginning in March 2000, however, value has dramatically rebounded and has quickly closed the gap in long-term performance. Few participants in the growth stock mania of the late 1990s seemed to have the historical perspective that value had outperformed growth through the mid-1980s as well as the early 1990s. At the end of 2001, historical returns of value and growth were basically equal over the preceding ten and twenty-year periods.

Similarly, prior to their recent comeback, small cap stocks were under-appreciated versus large caps during the late 90s. Once again, however, history shows that over the period 1980-2001, large and small caps each had eleven years of relative outperformance.

Looking at the major equity subclasses and styles, it is very difficult to predict which will do better in any given year, but it is very clear that, over time, performance should even out. Thus, it is risky for one subclass or style to represent a predominant portion of total equity holdings and a prudent asset allocation will have reasonable exposure to all sectors.

The Appendix contains a table that shows the one-year, five year, and ten year annualized returns through the end of 2001 for all major asset classes and subclasses.

Market Timing as a Strategy

Before examining the basic principles of asset allocation, there is an offshoot of the traditional process called “tactical asset allocation” which involves aggressive movement in or out of asset classes depending on current perceptions of their attractiveness. Looking at historical returns, a strategy that favors “tactical” short-term swings into or out of markets, as opposed to a strategy of disciplined asset allocation, appears unlikely to succeed. In general, investment strategies that worked in the past often don’t carry into the future. It is difficult to predict short-term swings in the market and in attempting to do so, market timers expose the portfolio to additional risk. This is because returns have been often concentrated in short periods.

Illustrating the concentration of returns, Ibbotson data show that if an investor had been out of the market during the S&P 500’s 40 best months from 1926 through 1998, he would have a return less than that of Treasury bills. For investors in the market during 1999, the last year of the bull market, the S&P 500’s return would have shrunk from 21% to less than 4% without the five best trading days. Similarly, a dollar invested in the S&P 500 Index at the end of 1960 would have grown to \$91.02 at the end of 2000. However, for an investor who had missed the 23 best months—less than 5% of the total—during the 40-year period, the return would have been only \$10.05, less than the \$10.53 he could have achieved from Treasury bills.

As further evidence of the benefits of a long-term investment approach, data from the past fifty years shows that the S&P 500 Index has risen only 54% of the time on any single day, but in 62% of the months, 79% of the years, 95% of the three-year periods, 98% of the five-year periods, and 100% of the ten-year periods. (As noted above, however, while the market’s returns have been predominantly positive in these periods, they have lagged behind inflation in a good number of them.)

Adding to the futility—and the substantial risks involved—in trying to predict market swings is the burden of transaction costs.

Investment Risk

Just as combinations of risky stocks exhibit less risk than individual securities, combinations of asset classes can have less risk than individual asset classes.

Consideration of investment risk is a vital component of the asset allocation process but it is not the only risk that fiduciaries must be aware of. *Operational* risk refers to the possibility that an investment manager will fail to fulfill its mandate due to violation of guidelines, trading errors, inadequate risk controls, or outright fraud. *Counterparty* risk refers to problems that may arise from irregularities pertaining to a particular exchange, broker, or other financial intermediary.

The *investment risk* of an asset consists of two parts: 1) *Systematic risk*, also known as market risk or beta, which springs from general economic factors (such as a sharp interest rate rise) that affects all companies in a similar fashion, although with different magnitudes, and 2) *Unsystematic risk*, which is unique to a particular asset (such as a potentially adverse ruling from a product liability case) and unrelated to the overall movement of the capital markets.

Another way of looking at the different types of risks is to consider systematic risk the market risk that investors are *given* and unsystematic risk the active risk that investors *take*.

Diversification eliminates unsystematic risk because the positive and negative results of specific companies within the portfolio tend to offset one another in a random fashion. Therefore, portfolios that are not well diversified are subject to increased volatility. Portfolio risk decreases as the number of stocks increases. Portfolios of 30 stocks or more will have most of the unsystematic risk eliminated, particularly if they are priced in the same range and held in similar amounts. Similarly, just as combinations of risky stocks exhibit less risk than individual securities, combinations of asset classes can have less risk than individual asset classes.

A traditional way of looking at investment risk is to compare the ranges of annual asset class returns over time. Those with wider ranges of returns are considered to have greater volatility. Risk measures the possibility of losing money and, although both large cap stocks and government bonds have lost money on an annual basis almost one quarter of the time since 1926, the magnitude of swings has generally been much greater for stocks. The S&P 500 returned 34.1% in 1995 while long-term bonds have never done better than the 18.2% registered by Treasuries in 1993. The S&P suffered a 26.5% loss in 1974, while the worst year for bonds has been the 7.8% loss in 1994. (Stock market volatility is even more evident in the NASDAQ Composite, which was up 85.6% in 1999 but down 39.3% in 2000.) In terms of quarterly performance, the differences are even more dramatic; since 1926, the worst quarterly return for bonds was -6.4% while that for large stocks was -37.7% and for small stocks -41.6%. Bonds often serve as a cushion against steep equity losses, as seen not only during the financial crisis of August 1998 when bonds had a positive return of 1.5% while stocks plummeted

by 14.5% but also during the years 2000 and 2001, when bonds had a two-year total return of 21% while blue chip stocks fell by 20% and the NASDAQ suffered a 52% collapse.

There are a number of ways to communicate investment risk. *Volatility*, or the uncertainty of an asset's return, is effective as a relative statistical measure. If an asset's returns over time are plotted on a graph, the arithmetic mean is the center of the distribution and the standard deviation (a number derived from a mathematical formula) measures the spread. If returns have a normal (bell-shaped) distribution, 68% of all returns are expected to be within plus or minus one standard deviation of the mean and 95% of all returns are expected to be within plus or minus two standard deviations of the mean. For example, using statistics from 36 monthly returns, an investor considers two investments which both had average monthly returns of 5%. The first, with a standard deviation of 2%, would have had a typical range of returns (two standard deviations) over the 36 months of between 1% (5% - 4%) and 9% (5% + 4%). The second investment, with a standard deviation of 4% for the same period, would have experienced more volatile returns, with fluctuations between -3% (5% - 8%) and 13% (5% + 8%).

As previously noted, annual returns on large cap stocks have been more than twice those of long-term government bonds since 1926, but the standard deviation of those returns is also more than twice that of bonds. This significantly greater volatility explains the "risk premium" that investors have traditionally demanded of stocks relative to bonds.

Data compiled by Ibbotson since 1926 show that both government and corporate bonds have had standard deviation of returns of about 9% while that of large cap stocks has been about 20% and that of small cap stocks (which had returns only slightly higher than those of large caps) was 30%. Looking at the figure for large caps, this means that with a compound annual return of about 11% over this period, returns would have been within the range of -9% (11% - 20%) and 31% (11% + 20%) two thirds of the time. Among other asset classes, intermediate bonds have shown about 60% of the risk of long-terms, and returns on real estate over the past 20 years indicate a relatively low standard deviation of about 7%.

The value of stocks as long-term investments is seen in their declining risk measures over time. The standard deviation of stock returns over a one-year period is 18% but drops to a very low 2% over 30-year holding periods, demonstrating that investors who can live with high variability of annual returns can expect a healthy composite return over long periods with a great deal of certainty.

After recovering from the Great Depression, annual volatility of large cap stock returns has changed very little from 1940 to the present. Indeed, the four-year period 1993-96 was the least volatile since 1963-66. On the other hand, volatility in bonds has increased substantially, first reflecting the higher inflation of the

1960s and 1970s and then reflecting the Federal Reserve's new policy of targeting money supply growth that it adopted in 1979.

Within fixed income, separate analysis is often done for high-yield bonds (higher expected return and higher volatility than high grades), and sometimes done for intermediate maturity bonds and inflation-protected bonds (TIPS), both of which have lower expected returns and lower volatility.

Correlation

The next step in asset allocation is to incorporate a measure of how various investments are expected to act relative to one another. The traditional input here is *correlation*, a measure of the degree to which two series move together. Correlation ranges from -1, where if one rises in value, the other will fall (inverse correlation) to +1, where if one rises in value, the other will also (perfect correlation) with 0 representing a totally random relationship. Ideally, investment portfolios would consist of negatively correlated assets but most assets exhibit moderately positive correlation. For example, Ibbotson data indicated in 1998 that government bonds and corporate bonds had a positive correlation of 0.94, German bonds and Japanese stocks had -0.06 (no correlation), and commodities and small stocks had a negative correlation of -0.40.

Correlations among asset classes are rarely stable and typically change over time in reaction to economic or political events. For example, correlations among European markets have risen over the past two decades with the formation of the European Economic Community. Even more strikingly, largely reflecting the Federal Reserve's changed monetary policy, the five-year rolling correlation between long-term bonds and large cap stocks—which was negative between 1956-66—had risen to the 0.30-0.60 range in the 1990s. The correlation between stocks and bonds rose even further to as high as 0.8 in the latter part of the past decade as falling interest rates (rising bond prices), supported by a decline in inflationary expectations, were one of the factors justifying higher stock prices. This correlation has turned sharply negative again in recent years, however, as bonds have been stable to strong in the face of the weakening economy but stocks have suffered their worst two-year period of losses in forty years.

By combining two assets into a portfolio, the expected return is an arithmetic average of the individual returns but the risk is dependent on the correlation between the two assets. If the assets are perfectly correlated (+1), there is no diversification gain and the portfolio risk is the average of those of the two assets. If the assets are negatively correlated, then all risk can be eliminated. If the assets are not correlated (the most likely case), some risk can be eliminated by combining the assets. Thus, the standard deviation of a portfolio constructed

by combining assets that are uncorrelated will typically be lower than that of either of the component assets.

History shows that small caps move together with large caps about three quarters of the time while the corresponding measures relative to large caps are about two-thirds for foreign equities, about 40% for real estate, and less than one third for bonds. Thus, bonds are seen as the best diversifying asset relative to large-cap equities and small caps the least effective in that regard.

Optimization

Optimization in asset allocation is the creation of a portfolio that will achieve a particular return objective with the least amount of risk or a particular risk objective with as high a return as possible. An investor can theoretically choose from portfolios that consist not only of 100% allotments to specific classes (i.e., stocks) but also every possible combination of these asset classes to make up a total portfolio (e.g., 40% bonds, 60% stocks). Graphing expected returns versus standard deviation for each of these combinations, one derives an “*efficient frontier*” of “optimal” portfolios that maximize expected return for each level of risk. Theoretically, adding more asset classes to the process will extend the frontier higher, producing higher returns for no additional risk.

If one were to construct the above-noted graph with expected investment returns on the vertical axis and risk on the horizontal axis, this graph would have an entry for an all-stocks portfolio in the upper right sector (high return, high risk) of the chart and for all-bonds in the lower left (lower return, lower risk) of the chart. (The absolute lowest risk, lowest return entry would represent Treasury bills in the far bottom left of the chart.) The practice of asset allocation, in its most basic depiction, involves drawing a line between the two extreme points and determining what combination of stocks and bonds strikes the right balance between an investor’s required return and the level of risk he/she is comfortable with. In reality, the choice will involve more than just two broad asset classes because both the stock and bond markets consist of several distinct styles and sectors and there also are the options of investing internationally as well as in additional asset classes such as real estate. Also, the “efficient frontier” of optimal asset combinations will typically be graphically represented by a curve whose points represent greater returns for a given level of risk than would be found on a straight line connecting the theoretical all-stocks, all-bonds, or similar points; this portrays the diversification gains that are achieved by combining asset classes that are not highly correlated.

Investment manager Roger Gibson, in a recent book on asset allocation, analyzed the returns of four major asset classes since 1972 on a year-by-year basis.

Analyzing volatility levels and returns for all possible portfolio combinations (including single asset investments and equally balanced combinations) using these asset categories, he concluded, “The pattern is clear. The more asset categories one includes in a portfolio, the higher the ... investment’s risk-adjusted rate of return.”

An important consideration in asset allocation is that, in order to produce portfolios that *will be* optimal, not that *were* optimal, the process of optimization requires *forecasted* expected returns, *forecasted* volatilities, and *forecasted* correlations. Historical data can, nevertheless, be very useful in the process of forecasting.

Many investment consulting firms have optimization software that produce recommended asset allocations based on modeling of asset class characteristics and inputs based on client needs and preferences. Confirming that computers cannot substitute for human judgement, consultants acknowledge that these optimizers might produce a recommended asset allocation that may appear extreme in the context of conventional investing practice. Thus, the end result of an asset allocation process is usually not the output of a predominantly quantitative model but is the result of a process in which the consultant and the client determine a combination of assets that not only should help the client achieve his/her goals over time but also satisfies the comfort level of the client.

On the Other Hand ...

There are several dissenting voices to the theoretical frameworks governing the search for today’s most efficient portfolios. First of all, some of the academic research that inspired today’s basic principles of asset allocation is questioned. Critics claim that it is wrong to focus on portfolio volatility rather than portfolio returns and that investors should be more concerned about the range of likely outcomes over the investment-planning horizon than with the volatility of those returns. Also, the role of using largely historical returns to determine future allocations is questioned because historical returns are not necessarily reliable indicators of future returns. Indeed, historical returns could actually be perverse indicators since they are the highest after market tops. Using correlation statistics in asset allocation models is problematical since most of the relationships are uncertain and constantly changing. (Particularly during large-scale financial or liquidity panics, investor psychology can render historical trading patterns and expected correlations totally irrelevant for an extended time, as the humbled managers of the fallen hedge fund Long Term Capital Management painfully learned in 1998.)

Another complaint is that attributing such a dominant role to asset allocation in

determining portfolio outcomes serves to unfairly minimize the importance of costs. Particularly for individual investors but also for institutional ones, differences in costs—operating expenses, management fees, brokerage commissions, custodial fees, et. al. —can play an important role in portfolio performance over time.

Also, besides the scholars who questioned the emphasis on the historically far greater short-term volatility of stocks relative to bonds, investors saw that the differential in volatility between the two asset classes appeared to have been narrowing in the 1990s. For bonds, interest rates became more volatile as the Fed has fine tuned monetary policy in order to keep the economy growing at a sustainable pace. At the same time, investors may have perceived less risk in stocks as a result of better investment education, new tax laws that lowered capital gains taxation rates and encouraged long-term holding in IRA accounts, better governmental monetary and fiscal policy, less governmental economic regulation, and diminished foreign threats which gave hope to an extended period of peace.

Finally, the historic bull market of the past decade seemingly convinced investors that stocks do indeed outperform bonds over time. Thus, many academics concluded that the “risk premium”, or extra return demanded by investors to compensate for the fact that stock returns are considerably more volatile than those of bonds, was declining. Of course, the events and markets of 2000 and 2001 have brought about a brutal re-assessment of this and other new age assumptions. Indeed, many investment strategists are now warning that pension funds may be seriously overestimating their expected returns from stocks over the coming years and that the unprecedented enthusiasm for equities shown by individual investors in the 1990s may not be seen again for some time.

International Investing

One of the most contentious areas of debate concerns the value of international diversification. By placing a portion of assets in markets considered uncorrelated with the US market, can an investor really reduce the volatility of the portfolio while maintaining and sometimes increasing returns? This is an increasingly open question as the world’s markets, particularly those of the developed countries, seem to be moving more in the same direction (if not in the same magnitude) in recent years. The bottom line is that the S&P 500 has outperformed composite international indices in five of the past six years, a period including both up and down markets. Looking at one important recent development, the monetary union in Europe that began in 1999 was seen as likely to further the trend of making the characteristics of—and the returns from—markets on that continent increasingly similar, and that indeed seems to be occurring.

The breakdown of trade barriers and advances in communications technology have meant that previously independent economies are becoming more correlated to our own.

The debate over the benefits of international diversification won't be resolved anytime soon, but it may indeed turn out that the benefits from that strategy may be overestimated because of the slow but steady trend towards an increasingly homogenized global economy. The breakdown of trade barriers and advances in communications technology have meant that previously independent economies are becoming more correlated to our own.

Certainly, there was no other major economy that had been firing on all cylinders like the US during the late 1990s, a fact that was clearly reflected in our booming stock market. No other country was at the forefront of the technological revolution and also enjoyed sound and stable economic and political leadership. The trouble with this argument against international diversification is that, as the 1990s began, investors were similarly drooling over Japan as the world's invincible economy. After more than a decade of stalled economic growth and failed political leadership, Japan's economic and financial market performance turned out to be nothing short of disastrous during the 1990s, and may actually be getting worse in the current decade. Indeed, at the beginning of 2002, the Japanese stock market was at a 17-year low, less than one quarter of its 1989 peak.

After doing well relative to US equities in 1999, international equities appeared poised for continued strong relative performance as the year 2000 began. The US had entered the eleventh year of an economic expansion, with joblessness at a 30-year low, and a stock market that had been rising steadily and was valued at historic highs according to most traditional measures. By contrast, Europe and Asia were several years behind in the growth boom and generally had much more capacity to expand, as seen in much higher unemployment rates and other measures. The US had spent the 1990s merging, restructuring, and deregulating as well as transforming itself into an information economy, while Europe had made only about half the strides of the US and Asia (particularly Japan) was just beginning along that road. It seemed reasonable that foreign market had more potential "upside" than the US.

In 2000, the US economy did begin to slow as the new economy equity bubble burst. In 2001, the US economy officially fell into a recession, exacerbated by the effects of the September 11 terrorist attacks, and stocks fell for the second consecutive year. It seemed to be the perfect scenario for foreign stocks to come to the fore. Nevertheless, the MSCI EAFE Index underperformed the S&P 500 by a combined 12% over these two years, reflecting the fact that no other major region of the world economy was able to buck the recessionary trend. Furthermore, the dollar remained the currency of choice in international currency markets as international investors had greater confidence in the economic stewardship of the US Federal Reserve than in any other central bank.

Analysis by Ibbotson Associates shows that the addition of *international stocks* to a simple portfolio of US stocks, bonds, and cash *slightly* improves the risk/return

tradeoff; that is, it slightly raises the frontier of efficient portfolios offering modestly better returns for a given level of risk. Looking at dollar-denominated returns over 1970-2001 for the countries in the Morgan Stanley Europe Australasia Far East (EAFE) Index, the composite annual return was found to be 10.2% vs. 11.9% for the US while the standard deviation was 16.9% compared to 15.6% for the US. While some individual countries in EAFE had compound annual returns higher than that of the US, their volatilities were significantly higher.

The major reason justifying the use of international stocks has been the fact that many non-US stocks have relatively low correlation with US stocks as well as with each other. Nearly every developed country has had a historical correlation of less than 0.50 versus the US, with the exception of Canada, whose correlation of around 0.75 reflects its strong economic ties to the US. As noted above, however, correlations are not stable over time and many analysts see correlations among countries' equity markets increasing in recent years.

A recent study by Yale University found that international correlations are indeed near the highest point in over a century. Correlation among developed markets was at 0.87 versus a thirty-year average of 0.61%. The study notes that correlations typically increase during periods of financial integration such as the one we're in. On the other hand, research by Ibbotson indicates that international equity correlations with the US have been rising more modestly.

While academicians continue their debate, the fact is that the world economy has been unusually uniform in its recent direction. The economic downturn of 2001 was the first time in the past thirty years that the US, Europe, and Japan were in recession simultaneously and no other region was able to buck the trend. On March 18, 2002, a headline in *The Wall Street Journal* declared, "One World: National Economies, After Fading in Unison, Hint at a Joint Upturn". The article noted: "For the first time in a generation, the world's major economies sank together last year. Now most appear to be perking up in unison as well—further evidence of how the fates of far-flung nations are increasingly interlinked."

This apparent trend in economic uniformity has been supported by lower trade barriers, far greater communication arising from the information systems revolution, and the fact that interest rates have been more closely aligned among major countries. Globalization has allowed investors to trade away and reduce price differentials between comparable stocks in different countries.

While skeptics of international investing certainly have strong arguments based on actual performance and correlation statistics of recent years, history does offer some solace to supporters of the strategy. Although the S&P 500 doubled the average annual return of the MSCI EAFE Index during the 1990s (17.5% vs 8.5%), it had under-performed its international counterpart by about 5% during both the 1970s and 1980s. As a result, as noted, the two indices are about even over the thirty-year period.

Beyond the obvious opportunities in being able to invest in the nearly 50% of the world's total stock market capitalization that is outside the US, there are some additional reasons to be optimistic about the prospects for international investing. First, after several years of strength, the US dollar is at a 16-year trade-weighted high versus global currencies and may be due for a decline—an occurrence that would be positive for the value of overseas investments by US investors. Second, valuations (price to earnings ratios, et al) in foreign markets are generally cheaper than those in the US.

Even with the question of rising correlations, international investing should offer good diversification benefits because of the increasing number of overseas markets open for investment. Beyond the markets for developed countries, additional diversification versus US markets can be obtained from *emerging markets*. These markets do have much lower correlations to the US market than developed countries but historical data indicates that returns are generally much lower and volatility much higher than that of the US. Emerging markets soared almost 80% in 1993, but have posted losses in five of the past eight years.

Among emerging markets, Argentina was the “basket case” at the beginning of 2002. However, three countries that had suffered a loss of investor confidence during the 1990s—Mexico, South Korea, and Russia—have each enjoyed strong rebounds in recent years. In fact, emerging markets overall held up so much better than developed markets in 2001 (MSCI's Emerging Markets index was down 2.4% compared to EAFE's 21.4% loss) that their 3-year annualized return through 2001 was +4.1%, compared to EAFE's 5.1% negative return. (Developed markets still maintained an edge for 5 and 10-year periods, however.) With US tech stocks having fallen from grace and a cloud of suspicion now hovering over the accounting integrity of many US companies, investors appear to be taking a fresh look at emerging market countries in 2002. In terms of valuation, emerging market stocks have rarely been cheaper relative to the US market than they are now.

While the case for international equity investing may have become more difficult in recent years, the justification for *international bonds* may be even murkier. First of all, assuming the countries are in similar stages of the economic cycle, non-US bond yields should be equivalent to US yields after currency adjustments are made. International bond investing also entails additional custodial costs, taxes, transaction fees, and possibly greater credit risk. International bonds (represented by the Salomon Brothers non-US Government Index) showed a slightly higher return over the seventeen years ending December 31, 2001 than US bonds (Lehman Brothers Aggregate Index) but with more than twice the risk. Hedged for currency risk, international bonds showed less risk than the US market but also less return.

One cannot dismiss the recent trends of global economic conformity and the disappointing returns from foreign equities over the past decade. Yet, it is also

undeniable that the global economy is becoming more developed and that international investing may be justified by the simple observation that the US share of the world economic product has been steadily declining and that an increasing number of the world's most important corporations are based overseas. Similar to restricting one's portfolio to a particular industry or style, limiting one's investments to a particular region or country serves to severely constrict one's opportunities in today's world economy. On the other hand, disadvantages of international investing include greater political and economic risk, currency risk, different accounting standards, and less efficient markets.

Alternative Asset Classes

There are two additional asset classes that have distinctive investment characteristics and which are used by many public retirement systems.

Real estate is known as one of the best hedges against inflation and, with very low correlation to the equity market, one of the best diversifying asset classes. Based on historical data, average annualized returns are expected to be 7-8% but with only about two-thirds of the expected risk of equities. The favorable risk-adjusted returns from this asset class are derived in part from its income component and staggered leases. Real estate has historically experienced far fewer years of negative return than stocks or bonds. There are two ways to invest in real estate: private investment, which generally provides steady returns, and real estate investment trusts, which are more volatile since they are publicly traded. Direct investment can be more labor intensive and is also relatively illiquid. Long-term performance indicates that REITs have provided better returns than direct ownership, but that may reflect their greater volatility and greater risk arising from the use of moderate leverage. There are a number of distinct sectors, such as office, apartments, industrial, and retail. Real estate suffered during the 1991-92 economic slowdown, but due to the lack of any significant overbuilding, has held up well and provided positive returns during the recent two years of stock market decline.

Under the general heading of "alternative investments", both the rewards and pitfalls of *venture capital* have been vividly demonstrated over the past few years. The ride to the top of the new economy bubble was very pleasurable for investors as the typical partnership provided annual returns in the high double digits and, in some cases, even triple digits. Correspondingly, the downside ride over the past two years has been marked by painful, significant losses. Over time, venture capital is expected to produce returns 3-4% above those of large cap equities but with at least two times the annual volatility. Investors in this asset class may choose between early-stage, mid-stage, late stage investments, although a good number of partnerships invest across the board. Partnerships may also

have specific objectives as to industry concentration. Venture capital is the most visible sector under the umbrella of private equity. *Buyouts*, another major sector, are considered to have a lower risk and return profile than venture capital.

Other Considerations in Asset Allocation

An effective rebalancing program is one that serves not only to reduce an asset class after an advance but also to buy one on weakness.

Some of the most important decisions in the asset allocation process occur after the basic asset class decisions are made. Increasingly, the next step in the process is not to directly commence an investment manager search but to decide what portion of the assets should be earmarked for *Active* vs *Passive* management. Evaluating the advantages and disadvantages of each style can involve many factors and competing arguments but the choice ultimately comes down to the chance for added value over a benchmark in an active approach versus a lower cost, more tax-effective (for non-pension investors) indexing approach (assuming an appropriate index product is available for a particular asset class).

Another frequent issue in asset allocation is *rebalancing*, or what to do when the allocation to a particular asset class goes above or below pre-determined ranges as a result of changed market values or other reasons. Rebalancing may be viewed as an offshoot of the axiom, “buy low, sell high”. Asset classes that have been over-sold and out of favor may well represent attractive opportunities while it may be wise to reduce exposure to those markets that have become unrealistically and unsustainably overextended on the upside. Other factors that enter into rebalancing decisions include transaction costs, liquidity, risk tolerance, and taxation (where applicable).

Among the typical disciplines for rebalancing are 1) to do it on a set schedule but at least annually, or 2) when an allocation is more than 5% away from its target. An option for retirement systems that do periodic cash flow investing is to rebalance by investing in the assets with allocations that are currently too low. Another option is for retirement systems to work with their consultants to consider a revision of their asset allocation.

An effective rebalancing program is one that serves not only to reduce an asset class after an advance but also to buy one on weakness. *Asymmetrical* rebalancing is a variation where the allowable upside drift is greater than the allowable downside drift. For instance, an asymmetric range might let stocks drift up by 6% above the current range but down by only 3% before a rebalance is triggered. Using this scheme, holdings of domestic stocks in a portfolio with a targeted range of 35-45% for this asset class could go as high as 51% or as low as 32%. Since the average magnitude of equity bull markets is about twice that of bear markets, this type of strategy would allow investors to capture more of a bull market before a rebalancing is triggered but also to take advantage of an asset class's weakness.

In addition to market-driven events that could lead to a rebalancing, asset allocation policies must be considered when an investor's circumstances change. For individual investors, revisiting asset allocation would follow changes in lifestyle (children, marriage status, death, etc.) or change in income (promotion, career change, unemployment, or a major inheritance), or changes in investment objectives arising from time to retirement, real estate purchase, or education expense.

For a pension fund, revised actuarial assumptions are one of the most likely triggers for asset allocation rebalancing. Also, it might be reasonable for the risk level assumed by a portfolio to be determined by the degree of funding; a retirement fund with a large unfunded liability and long funding period might be justified in an asset allocation dominated by equities while one that is fully funded or close to it might adopt a more conservative, income-oriented strategy.

Whatever the methodology used, there are no regulatory obstacles to rebalancing for Massachusetts retirement systems since PERAC regulations no longer establish permitted percentage ranges for major investment asset classes. The past two years of stock market decline have brought about a propitious opportunity for portfolio rebalancing and several systems have been doing just that. With historically low interest rates causing many consultants to lower their projected returns from bonds and with most stocks at their lowest level in several years, a number of systems have been adding to equity allocations whose percentages relative to the total portfolio have declined due to market action.

Summary

Asset allocation is a practice whose benefits have not enjoyed universal intellectual support among market professionals. In the late 1990s, investment publications frequently proclaimed the irrelevancy of traditional asset allocation models. An article in *The Wall Street Journal* of February 7, 2000 bore the headline, "Fund Diversification Dies a Not Very Slow Death." It noted the increasing difficulty of financial planners in defending asset allocation in light of the continuing dominant performance of large cap and technology stocks. While it had been a glorious market for investors with portfolios concentrated in these hot areas, it had been "a bear market for asset allocators" in the words of one observer. Nevertheless, this article also noted that asset allocation actually did fairly well in 1999 in several respects. Although value stocks continued to badly lag growth stocks, international stocks outperformed the S&P 500, emerging markets had a banner year, and small cap stocks also beat the large-cap S&P 500.

More importantly, within a month of that article's publication, the NASDAQ bubble burst and the stock market began its worst two-year period in thirty years. Not only have value stocks outperformed growth by 30% or more, but bonds and

Asset allocation can be seen as an insurance policy against the day when today's hottest sector inevitably cools down.

other asset classes such as real estate have proven to be valuable diversifiers.

A healthy debate will continue over the value of asset allocation and the best way to implement it. Nevertheless, in its most basic form, the objective of asset allocation remains one of prudence. Specific asset classes or subclasses may often appear either over-valued or under-valued but, before they revert to the norm, they may well trade to even further extremes and the aberrations may last much longer than expected. Asset allocation can be seen as an insurance policy against the day when today's hottest sector inevitably cools down. Anticipating that day is difficult, and the opportunity costs in investment returns become real and sometimes painful when one sector such as US large cap growth stocks is dominant for so long. But history and logic both tell us that that day will inevitably come.

At its best, asset allocation should not incorporate rigid, inflexible asset ranges nor should it encourage aggressive, frequent market-timing bets. The most effective use would emphasize the value of diversification among asset classes but also provide the flexibility to act when markets become clearly overvalued or undervalued.

In summary, the goal of asset allocation is to select a combination of assets that will generate a return sufficiently high but also sufficiently safe in order to meet a future financial liability. As noted at the beginning of this report, it is simply an expression of the centuries-old axiom, "don't put all your eggs in one basket." To use an even more comforting analogy, asset allocation is like a pillow: if one part of the pillow is punched in, another will puff out, and the benefits of portfolio diversification will provide the investor with steady enough returns so that he or she can sleep well at night.

In reality, the world's financial markets—and the relationships among them—are sufficiently dynamic and constantly changing so that asset allocation in practice does not conform to simple and cute analogies. Nor does it lend itself to simply choosing portfolio combinations from a neatly drawn graphical curve of "efficient portfolios". Asset allocation remains more an art than a science since the models and assumptions used are approximations of the realities of an investment universe that is exceedingly complex and constantly changing.

The Real World

Despite the lingering controversies and the multitude of available optimization models, there seems to be a surprising degree of uniformity in the typical asset allocation of public pension funds across the country.

Following is an analysis of the estimated asset allocation at year-end 2001 of the 85 Massachusetts public pension systems that invest on their own. Also shown are the reported asset allocations of two major public pension funds, the Massachusetts Pension Reserves Investment Management Board (PRIM)—in which eighteen PERAC systems invest all their assets—and the California Public Employees Retirement System, the nation's largest public system. The reported asset allocation of the nation's 1000 largest defined benefit systems is also shown. Care should be taken in making direct comparisons among specific asset classes in these plans because of possible differences in classification methodology.

PERAC Systems (12/31/01)

| | |
|----------------------------|-----|
| Domestic Equity | 46% |
| International Equity | 9% |
| Domestic Fixed Income | 33% |
| International Fixed Income | 2% |
| Real Estate | 5% |
| Alternative Investments | 2% |
| Other | 1% |
| Cash | 2% |

California Public Employee Retirement System (CALPERS) 12/31/01

| | |
|----------------------------|-----|
| Domestic Equity | 40% |
| International Equity | 18% |
| Domestic Fixed Income | 23% |
| International Fixed Income | 4% |
| Real Estate | 9% |
| Alternative Investments | 5% |
| Cash | 1% |

Mass. Pension Reserves Investment Trust (PRIT) 12/31/01

| | |
|-------------------------|-----|
| Domestic Equity | 42% |
| International Equity | 16% |
| Fixed Income | 25% |
| Emerging Markets | 4% |
| Real Estate | 6% |
| Alternative Investments | 5% |
| High Yield | 3% |

“Pensions & Investments” The largest defined benefit plans 12/31/01

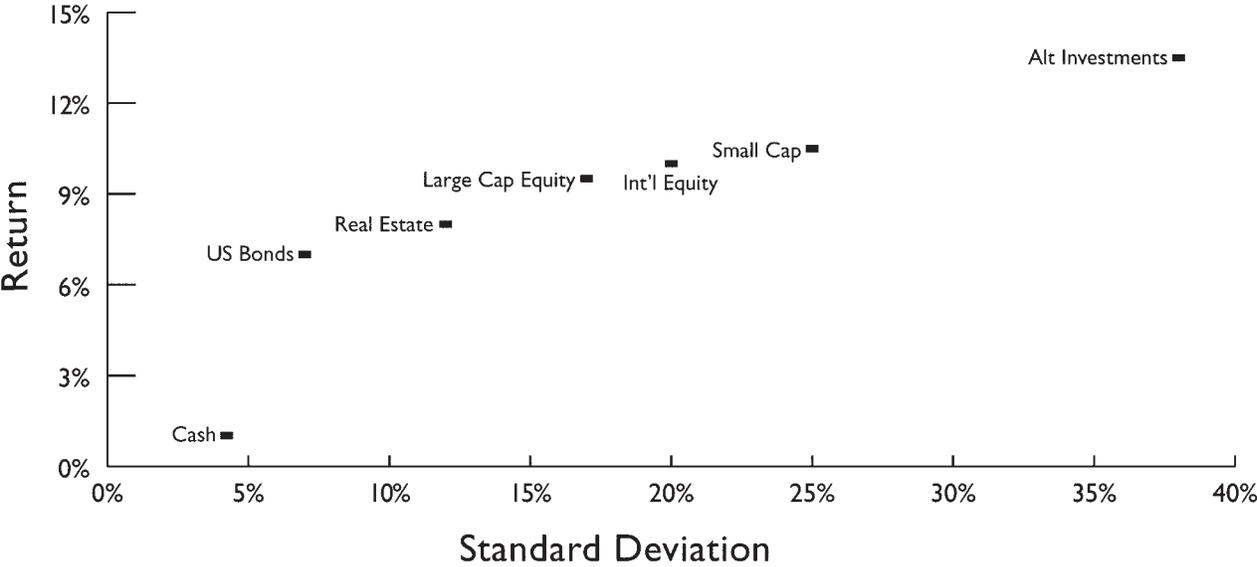
| | |
|----------------------------|-----|
| Domestic Equity | 44% |
| International Equity | 13% |
| Domestic Fixed Income | 30% |
| International Fixed Income | 2% |
| Real Estate | 4% |
| Alternative Investments | 4% |
| Other, cash | 4% |

Historical Returns

AVERAGE ANNUALIZED RETURNS

| | 2001 | 5 YRS | 10 YRS |
|--|---------|---------|---------|
| EQUITY | | | |
| Wilshire 5000 (Broad Market) | -10.96% | +9.69% | +12.27% |
| Standard & Poor's 500 (Large Cap) | -11.89% | +10.70% | +12.94% |
| S&P 500 Barra/Growth | -12.73% | +11.10% | +12.31% |
| S&P 500 Barra/Value | -11.71% | +9.49% | +13.10% |
| Russell 2000 (Small Cap) | +2.49% | +7.52% | +11.51% |
| Russell 2000 Growth | -9.23% | +2.87% | +7.19% |
| Russell 2000 Value | +14.03% | +11.21% | +15.12% |
| MSCI EAFE (International) | -22.01% | +0.75% | +4.39% |
| FIXED INCOME | | | |
| Lehman Brothers Aggregate | +8.44% | +7.43% | +7.23% |
| First Boston High Yield Index | +5.80% | +3.25% | +7.84% |
| REAL ESTATE | | | |
| NAREIT Composite | +15.50% | +5.58% | +10.94% |
| NCREIF National Property Index | +7.41% | +12.23% | +8.26% |
| ALTERNATIVE INVESTMENTS | | | |
| Venture Economics US Private Equity Performance Index (through 9/30/01) | | | |
| Venture Capital | -32.4% | +37.9% | +27.4% |
| All Private Equity | -21.4% | +17.9% | +18.8% |

Projected Asset Class Risks and Returns



Commonwealth of Massachusetts
Public Employee Retirement Administration Commission
5 Middlesex Avenue
Third Floor
Somerville, MA 02145
ph 617 666 4446
fax 617 628 4002
tty 617 591 8917
web www.mass.gov/perac