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Constructing Risk-Minimized Investment Portfolios

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Low-cost index mutual funds offer planners an opportunity to minimize the risk of their clients' investment portfolios.

A previous article established that very few, if any, active investment managers outperform the broad averages in their respective markets over the long run. (See "The Role of Index Funds in Developing an Optimal Investment Strategy," *Personal Financial Planning,* May–June 1993, p. 3.) Two questions are relevant to this argument. The first pertains to whether a statistically significant number of portfolio managers outperformed the market. This question can be left to the academics to argue. The revelant question facing the individual investor and investment adviser is whether superior managers can be selected in advance of their above-average performance with any degree of reliability. This is a harder argument to prove because it assumes that either portfolio managers do outperform the market over the long run, or alternatively, short-term superior performance can be continually identified in advance. An increasing number of studies make a very strong case that superior investment managers cannot be selected consistently.

Recognition of this reality has led to the growing popularity of index mutual funds. They provide a high degree of diversification while their low expense ratios detract less from overall return than actively managed funds. The result is that these investment vehicles outperform most, if not all, alternatives over the long run. An additional advantage index funds offer lies in their relatively consistent relationships with one another. Planners can take advantage of this consistency by constructing index mutual fund portfolios that exhibit the least amount of volatility (risk) for any given target return.

Two-Dimensional Diversification

Diversification is achieved in two ways. First, by owning a large number of securities and, second, by owning diverse classes of securities. Accordingly, diversification can reduce volatility in two ways.

The more obvious one pertains to quantity diversification. If no one security makes up a large portion of the overall portfolio, poor performance by any one security will not significantly affect overall performance. Diversification can also reduce volatility through the hedging effects of asset-class diversification. This occurs because economic events affect different classes of securities in a lesser or opposite manner. For example, a strengthening dollar will have a negative effect on US exports and, in turn, many US equities, whereas foreign companies will benefit from their improved ability to sell goods to the US. Therefore, a portfolio holding both domestic and foreign equities is, to a degree, hedged with respect to currency movements. It will provide more consis-

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tent returns than a purely domestic equity portfolio.

Investors make the common mistake of assuming that ownership of one or two index funds provides effective diversification. A portfolio invested in one or two types of such funds lacks sufficient asset-class diversification. History has demonstrated that individual asset classes can experience long periods when little or no return is realized. An example of this can be seen by examining two extended time frames, 1937–1950 and 1965–1981, when the Dow Jones Industrial Average Index (DJIA) provided no growth. In 1937, the Dow measured just under 200. Thirteen years later it was still under 200. A similar situation was encountered during the 1965–1981 period. An investment in the DJIA index during these periods provided a return equal to dividend yield only. This demonstrates the dangers of insufficient asset-class diversification.

The most important aspect of portfolio management is selecting asset classes and their weightings within the overall portfolio. In a 1986 article, "Determinants of Portfolio Performance," Brinson, Hood, and Beebower examined the returns realized by 91 large US pension plans over the 1974–1983 period. They segmented the overall return of each pension plan, isolating the return attributable to each of the three activities that make up the portfolio management process: investment policy, market timing, and security selection. Investment policy—the selection of asset classes and their weightings—proved responsible for more than 90% of the variation in return among the pension plans. Less than 10% of return variation was attributed to market timing and security selection collectively.

Clearly this demonstrates that financial planners must pay particular attention to investment policy decisions when constructing a client's investment portfolio. The following analysis of historic returns pertaining to asset classes provides a structured approach to setting portfolio investment policy.

Correlation Analysis

The relationship between two variables' movements over time is measured by their correlation coefficient. Correlation coefficients are calculated by regressing historic return data. A measurement of +1 results when two variables move in lockstep, while −1 indicates the exact opposite movements. A correlation coefficient of 0 indicates no linkage of movement. To obtain valid correlation measurements many data points must be used over a period that encompasses a number of market cycles. Measurements over a few years will not suffice. A couple of decades are required.

Correlation analysis should be restricted to entities that have not changed significantly over the period for which data was taken nor are expected to change significantly during the projected investment horizon. This is a profound restriction when applying correlation analysis to individual securities.

Most corporations will not react to economic events in the future as they did in past decades. Historic figures pertaining to US Steel, for example, do not provide insight into how USX will perform under similar economic environments in the future. It is not the same company. Since IBM is facing an uncertain future as a result of internal problems and changes within the computer industry, its future performance may have little resemblance to its past. Indeed, it is hard to think of many companies that have not changed significantly over the past few decades and will not change significantly over the next few.

The use of correlation analysis in conjunction with actively traded mutual funds can reveal information only about the types of securities the funds invest in, but not about the specific funds.

Index Fund Analysis

In addition to providing better-than-average long-term performance, index mutual

EXHIBIT 1
Correlation Coefficients of Ten Selected Indexes (1970–1979 and 1980–1989)

	Small US	S&P 500	T-Bill	T-Bond	US Crp Bond	EAFE	Small Japan	Large Japan	Small UK	Large UK
January 1970–December 1979										
Small US	1.000									
S&P 500	.761	1.000								
T-Bill	−.039	−.099	1.000.							
T-Bond	−.250	.388	−.044	1.000						
US Crp Bond	.377	.530	−.124	.845	1.000					
EAFE	.465	.511	−.194	.129	.243	1.000				
Small Japan	.217	.168	−.320	.030	−.033	.625	1.000			
Large Japan	.275	.302	−.350	.096	.091	.738	.832	1.000		
Small UK	.408	.334	−.154	.081	.188	.737	.299	.345	1.000	
Large UK	.462	.446	−.083	.148	.264	.760	.212	.307	.907	1.000
January 1980—December 1989										
Small US	1.000									
S&P 500	.855	1.000								
T-Bill	−.169	−.171	1.000							
T-Bond	.168	.310	.071	1.000						
US Crp Bond	.149	.288	.068	.948	1.000					
EAFE	.450	.465	−.242	.233	.167	1.000				
Small Japan	.166	.220	−.267	.157	.136	.654	1.000			
Large Japan	.223	.243	−.176	.128	.073	.884	.696	1.000		
Small UK	.506	.492	−.204	.170	.114	.710	.458	.455	1.000	
Large UK	.545	.563	−.177	.244	.173	.723	.411	.424	.940	1.000

funds are superior investment vehicles owing to their relatively consistent relationships. Compared with individual securities, or actively traded mutual funds, index funds react with more consistency to similar economic environments. This consistency represents an opportunity. Historic performance data can be used to make relatively reliable projections about the performance of index fund portfolios under unpredictable future economic environments. Through the use of performance analysis, index fund portfolios can be constructed that exhibit a high degree of two-dimensional diversification with relatively reliable asset-class hedging characteristics.

While index funds do change with time, it can be reasonably assumed that macroeconomic events will affect broad market averages in a similar manner in the future as in the past. Therefore, their movements, with respect to one another, will be somewhat consistent. This proposition makes intuitive sense. However, how does it hold up to testing? To examine this, the relationships between indexes must be quantified and compared over different periods.

Regression analysis based on monthly returns pertaining to 10 indexes over a total of 20 years, divided into two 10-year periods, is shown in Exhibit 1. Included are both foreign and domestic equities and bonds. An examination of this correlation matrix reveals a strong degree of consistency between the correlation coefficients in the two periods for virtually all of the paired relationships.

The analysis shows a strong correlation between small US stocks and the S&P 500 in both periods (.761 and .885). The most negative correlations occur between

EXHIBIT 2
Correlation Coefficients of Four Selected Indexes (1926–1985)

	January 1926–December 1945				January 1946–December 1965				January 1966–December 1985			
	Small US	S&P 500	T-Bill	T-Bond	Small US	S&P 500	T-Bill	T-Bond	Small US	S&P 500	T-Bill	T-Bond
Small US	1.000				1.000				1.000			
S&P 500	.828	1.000			.791	1.000			.776	1.000		
T-Bill	−.076	.009	1.000		−.019	−.084	1.000		−.100	−.060	1.000	
T-Bond	.065	.135	.052	1.000	−.006	−.103	.085	1.000	.194	.351	.110	1.000

the Treasury bill index and small Japanese stocks (−.320 and −.267).

To test if this consistency held up over longer time frames, the indexes for which data was available back to 1926 were regressed over three consecutive 20-year periods spanning January 1926 to December 1985. Exhibit 2 shows the applicable correlation matrices. Again, a strong degree of consistency is revealed.

Portfolio Construction

The analysis confirms the "reasonable" assumption that these relationships will hold up during coming decades. Therefore, asset-class hedging can be built into portfolios by including indexes that display weak or, ideally, negative correlations.

Recently developed software can assist in building portfolios on the basis of such data as the figures described earlier. The use of this approach minimizes unnecessary volatility for any target return. An example of this portfolio building technique is shown in Exhibit 3. It is based on monthly data taken from the 22-year period from 1970 through 1991.

Comparing Portfolios

Portfolios 1 and 2. Comparing portfolio one (P1), made up entirely of the S&P 500, with P2, containing equal portions of the S&P 500 and long-term corporate bonds, reveals the fact that the owning of bonds as well as stocks reduces volatility significantly but also reduces return. This is due to the fact that stocks and bonds move somewhat independently of one another and stocks provide better long-term returns. However, if volatility reduction is the goal, P6 does this as effectively while offering a much higher return. P6 combines the growth potential of weakly correlated small domestic and small international stocks with negatively correlated Treasury bills.

Portfolios 3 and 9. Comparing the exclusively domestic fixed-income portfolio P3 with P9 shows that a small shift toward international equities can provide a higher return while slightly reducing risk.

Portfolio 4. Comparing P4, a domestic stock/bond portfolio, with P9 again demonstrates the advantages of international exposure; reducing volatility without giving up return.

Portfolios 5, 6, 7 and 10. P5, the most highly diversified of the sample portfolios, is one of the better choices for a client that is comfortable with this level of volatility. However, shifting weight toward small equities in P10 provides a significantly higher return at the same level of risk. This advantage is also revealed by P6 and is inversely confirmed by the large stock weighted P7.

Portfolio 8. P8 offers the highest potential return to an investor willing to endure high volatility.

By working with such examples as

EXHIBIT 3
Sample Portfolios January 1970–December 1991

	Weighting (%)									
	1	2	3	4	5	6	7	8	9	10
Small US				20	10	20		30		20
S&P 500	100	50		20	10		30			
T-Bill			20	20	10	20	10	10	20	20
T-Bond			40	20	10				30	
US Corp Bond		50	40	20	10	20			30	10
EAFE					10				20	
Small Japan					10	20		30		25
Large Japan					10		30			
Small UK					10	20		30		25
Large UK					10		30			
Annual Return	11.6	11.1	9.3	10.5	14.9	15.2	15.0	18.0	10.4	16.4
Standard Deviation (monthly)	4.7	3.3	2.5	2.8	3.6	3.2	4.4	4.5	2.3	3.6
Growth of $1	11.3	10.1	6.7	9.1	21.1	22.7	21.8	37.9	8.8	28.3

these and actual year-by-year sample portfolio return figures, the planner can arrive at a decision with the client regarding risk tolerance and target return. A portfolio can then be selected that has a very good chance of meeting those requirements.

Limitations

Three points of caution should be taken into account. Broad markets do change and with them their correlation relationships. Accordingly, small differences in sample portfolios will not necessarily hold up in the future. A couple of tenths of 1% difference in standard deviation or annual return is not a reliable disparity. However, a difference of 6.4% in annual return coupled with essentially equal standard deviations, for example, between P1 and P8, is a significant indicator of future performance disparity.

A second caveat is particularly important for planners and clients to understand. Actual total returns over the next decade may be different from those realized over the 22-year sample period. During the past 10 years, the US stock market provided an average annual return of approximately 17%, 6% to 7% higher than longer-term measurements. During the 1970s, inflation soared and fixed-income investments provided nominal rates of return much higher than average. If, during the next decade, interest rates remain low and the equity markets experience a sustained period of low growth, actual total returns for all portfolios may be lower than those shown here. In a rising or falling sea all boats are affected equally. However, such an environment will not diminish the effectiveness of the portfolio construction technique described previously.

A final limitation should be realized. Quantitative analysis of historic returns is only one tool and should not be relied on exclusively. Knowledge of investment markets is also a key factor. As an example, the high returns that Japanese equity investments have provided over the past few decades should not lead planners to the conclusion that similar returns will be realized in the future. During this period, Japan was rebuilding its economy from the devastation of World War II. How-

ever, the relationships revealed by regression analysis between Japan's securities markets and other markets can be expected to hold up in the future. Such evaluations as this fail to show up in historic figures but should not be overlooked in the portfolio construction process.

To achieve higher long-term returns an investor must accept higher volatility. However, higher volatility does not necessarily produce higher returns. In addition to the advantages index funds represent individually, their consistent relationships facilitate the construction of portfolios that display minimal volatility for any given target rate of return.

Most investment advisers take a less calculated approach to diversification. Given their view of the economy and a feel for the client's risk tolerance, they recommend somewhat arbitrary percentages of equity, fixed-income, and cash-equivalent securities. While predicting future markets is not an exact science and any short-term period can produce results that deviate from expectations, the approach described here will produce effective long-term results. Its strength lies in the fact that it uses the most efficient investment products available—index mutual funds—and is based on market relationships that have demonstrated a high degree of consistency over many decades. The relationship between risk and return is by no means overcome. However, unnecessary volatility can be minimized and this will result in more satisfied clients and more effective investment advisers. ■