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Yes, Virginia, there really is skewness.

In the last issue of IT Insights ("Standard Deviation: Caveat Emptor"), we saw that skewness in investment returns can have a dramatic impact on performance results and, consequently, what actions we might take based on these results.

But are asset returns really skewed? Or is the normal, bell-shaped distribution (and hence standard deviation) adequate for modeling returns and measuring performance?

Normal or Not Normal?

To answer this question, Investment Technologies, in conjunction with William H. Seaver, Ph.D., Seaver Statistical Services, conducted an in-depth study of historical returns for five major indices.

The results are dramatic: Historically, returns have *not* been normally distributed in three out of every five periods analyzed. These findings have significant implications for investment practitioners using standard deviation to measure the risk of their portfolios—-using the normal distribution can lead to false conclusions about a portfolio's true risk.

In this study, the distributional characteristics of five major market indexes representing broad asset classes were examined: the S&P 500 for large-cap stocks, Russell 2000 for small-cap stocks, MSCI EAFE for foreign stocks, Lehman Aggregate for bonds, and 90-day Treasury Bills for cash equivalents.

Table 1 Historical Data Used

Index	Dates	Years
S&P 500	1937-1993	57
Russell 2000	1976-1993	18
MSCI EAFE	1970-1993	24
Lehman Aggregate	1973-1993	21
T Bills	1937-1993	57

Using monthly data from 1937 through 1993 for S&P 500 and T-Bills and inception dates for other indexes (early to mid-1970's), a total of 161 subperiods ranging from 3 to 57 years were reviewed, providing a comprehensive representation of a variety of market conditions.

Not Normal 60% of the Time

As Figure 1 shows, the results are dramatic. Overall, returns for the five indices were *not* normally distributed more than 60% of the time. That means that standard deviation was *not* an appropriate representation of risk in three out of every five time periods examined. The frequency of non-normality for individual indices ranged from 45.5% (almost one out of every two periods) for MSCI EAFE to 85.7% (six out of every seven periods) for Russell 2000.

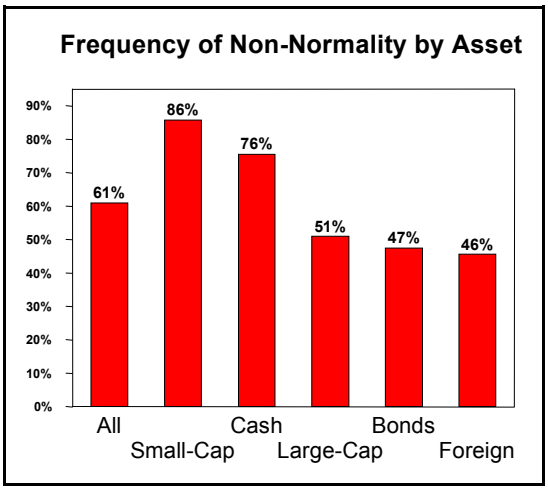

Figure 1: Frequency of Non-Normality in Returns by Asset

The length of the time period is an important factor. The longer the time period, the more likely return distributions were non-normal. For all indices, returns were *not* normally-distributed almost all (97%) the time for 11-57 year periods, nearly three-quarters (72.7%) of the time for 6-10 year periods, and 43% of the time for 3-5 year periods.

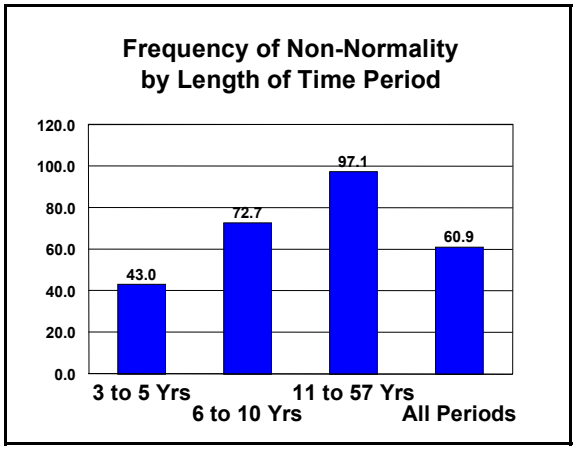

Figure 2: Frequency of Non-Normality by Length of Time Period

Yes, Skewness Exists

Skewness and kurtosis are the standard statistics used to measure any non-normality in data such as monthly performance returns. Of these, skewness is the more important. Skewness measures the direction and degree of asymmetry of a return distribution. A normal distribution is bell-shaped, a positively skewed distribution has a longer tail on the right, higher-return side of the curve, and a negatively skewed distribution has a longer tail to the left, lower-return side.

When there is positive skewness, performance was actually achieved with less risk than indicated by standard deviation. Conversely with negative skewness, where performance was actually achieved with more risk than standard deviation suggests. Thus standard deviation overstates risk for positively skewed return distributions and understates risk for negatively skewed return distributions.

Skewness was found to be a contributing factor in almost half (47.2%) of the time periods analyzed. Interestingly, returns for the three stock indices were virtually entirely negatively skewed while returns for the fixed income indices were predominantly positively skewed.

Kurtosis, the other contributor to non-normality, is a measure of how peaked a set of returns is compared to a normal distribution. Positive kurtosis indicates a distribution with a high peak, while negative kurtosis indicates a flattened distribution.

Kurtosis was found to be a factor with about the same frequency as skewness (47.2%).

PMPT—a Better Way

With The Expert Allocator and The Expert Performance Analyst, investment practitioners can automatically take skewness into account in both asset allocation analysis and performance measurement. Both Experts offer Post Modern Portfolio Theory tools to evaluate the true performance of managers, mutual funds, and other portfolios without the restrictions imposed by standard deviation.

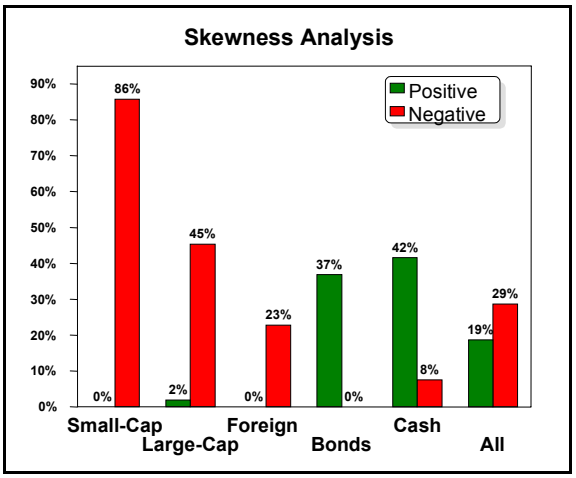

Figure 3: Positive and Negative Skewness in Assets

With The Expert Allocator for asset allocation, you can incorporate skewness both in forecasts for asset returns (by using the true rather than the normal distribution) and in optimization (by using downside deviation rather than standard deviation as the risk measure).

The tools of PMPT have direct application in performance measurement as well. The Expert Performance Analyst helps you to understand how performance results were achieved and whether there was compensation for the level of risk taken.

For more information on The Expert Allocator and The Expert Performance Analyst for Windows, please call us at 203/364-9915 or visit our website at www.InvestmentTechnologies.com.■

Study Methodology:

For the period 1937 through 1993, 161 sets of observations were made to test the normality hypothesis. These observations covered five major asset classes over a wide range of sub-periods. The periods are consecutive 3-, 5-, 10-, and 20-year period from inception through 1993; consecutive decades through 1980s; and inception through 1993, 1990, 1985, 1980, 1975, 1970, 1965, 1960, 1955, 1950, and 1945.

Rigorous statistical techniques were then used on each observation set to test the hypothesis that at the 95% confidence level the natural logarithms of 1 plus the monthly returns were normally distributed.

The 161 sub-periods ranged from3 to 57 years in length depending on the data available for the respective index. In all cases the maximum amount of available data were used. The methodology used to select the sub-periods ensured that problems of "end-point" and "starting-point" sensitivity would be minimized. To further reduce bias caused by specific short time periods, we used only consecutive time periods rather than rolling time periods. The same sub-period selection criteria were used for each index.