WEEKLY MARKET MONITOR
JUNE 16, 2008

DOUGLAS FORE
DIRECTOR OF PORTFOLIO
ANALYTICS

UNDERSTANDING RISK-ADJUSTED INVESTMENT RETURNS

The fundamental idea of modern portfolio theory is deceptively simple. **Assets should be chosen on the basis of how they interact with one another rather than how they perform in isolation. According to this theory, an optimal combination would secure for the investor the highest possible return for a given level of risk or the least possible risk for a given level of return**. Put another way, in an efficient portfolio, the relationship between a portfolio's total expected return and the extra contribution to the total portfolio risk of the last dollar invested in that portfolio should be identical for all assets in the portfolio.

What follows from this basic concept is that investors should realize that an investment's contribution to the portfolio's risk must not be assessed in isolation. An investment's contribution to the portfolio's total risk is related to all of the investments in the portfolio, and the investment's interaction with the other investments in the portfolio results in a marginal contribution to the portfolio's total risk that is often not obvious. In other words, investors need to estimate not only the volatility (also known as "variance" or "standard deviation") of each type of investment return, but more importantly, the relationship between the returns of each investment and the rest of the portfolio's returns. This latter concept is called "covariance," which is a simple function of an investment's volatility and its correlation with other investments. For example, if the returns on two securities are not correlated at all, then the covariance of the two securities is zero. If the returns on a pair of securities are correlated, negatively or positively, then the securities will be covariant. If correlation and variance among all of the various investments in a portfolio remain stable over time, then estimates of all of the covariances among those investments will also be stable.

In practice, correlation and volatility are not stable. This is especially the case in times of financial distress, when the correlation of many different securities is known to change rapidly, as in the well-known case of hedged portfolios suddenly revealed to be precarious because the correlations moved in lockstep. In addition, volatility often changes rapidly and unfavorably—it is often characterized as having negative asymmetry—in times of financial distress. The combination of changing correlation coupled with changing variance can produce a large change in the covariances among all of the assets in a portfolio. One consequence of this is that when assessing an investment's contribution to the portfolio's risk, it can become significantly more difficult to do so during changing times.

How does all this work in practice? We can begin to construct an efficient portfolio by making the unrealistic assumption that correlation and variance are both known and stable. We can further assume we have identified an investment that is a risky asset, but with a risk profile completely independent of the other risks in the portfolio (i.e., correlations = 0). Adding this asset to the portfolio would allow us to increase the portfolio's returns while maintaining the portfolio's risk at the desired level. This risky asset is a perfect diversifier for the portfolio. An asset that diversifies the portfolio by increasing the portfolio's total returns, while maintaining the desired risks, is a valuable addition to the portfolio. In accordance with the fundamental idea of modern portfolio theory, we would continue purchasing such an asset until the ratio between its return versus risk is, dollar for dollar, equivalent for all of the assets in the portfolio.

Consider a diversified portfolio where the expected marginal return on each security or asset class is the same. If this condition did not hold, the investor would reallocate funds away from securities with lower expected returns toward securities with higher expected returns. We can also assume that the portfolio contains one somewhat less risky asset (e.g., bonds) and one somewhat more risky asset (e.g., stocks). As we have seen, it is necessary to know the correlation of expected returns between the more and less risky assets in order to calculate the expected volatility. It is also necessary to know the portfolio's weights (i.e., the proportion of the portfolio invested in each asset) in order to calculate the portfolio's expected returns. In effect, the total portfolio return is equal to the sum of each asset's weight times its expected return.

The volatility of the portfolio is the sum of each asset's individual standard deviation times its weigh, plus the sum of the covariances between all of the assets in the portfolio. When we consider again the portfolio with one less risky asset and one more risky asset, we would note that no responsible investment advisor would recommend that a client choose only a single more risky asset as a portfolio complement to their preferred amount of less risky assets. Individual risky assets are subject to numerous idiosyncratic risks, which are, at best, expensive and, at worst, impossible to diversify away. Consequently, large positions in risky assets expose investors to these idiosyncratic risks and expose their portfolios to significant downside losses.

A similar conclusion holds for portfolios composed of arbitrarily small numbers of risky assets. Although portfolios of two or three risky assets are used in finance texts to mathematically illustrate portfolio construction and diversification, these portfolios are not meant to be implemented in practice. This necessarily raises the question of how many risky assets are needed in order to form a properly diversified portfolio. While there is no consensus on a minimum number, it can reasonably be said that the number should be large enough so that if one of the risky assets were to sustain a large loss, it would not have a material impact on the overall portfolio.

Once the decision of how much to save has been made, individuals must choose the risky assets for their portfolios, as well as the proportion of risky and less risky assets in the total portfolio. Risky assets are priced according to their expected discounted payoffs, with the riskiest assets having the highest expected payoffs. Risky assets are commonly grouped in asset classes of varying degrees of expected risk and return. Thus, U.S. corporate bonds are riskier than U.S. Treasury bonds and consequently are priced at a discount to reflect that risk. In turn, U.S. corporate equities are riskier than U.S. corporate bonds and U.S. Treasury bonds and are priced at a discount to both. It is particularly worth noting here that the equity of a corporation is a residual claim and that dividends on equities are only payable to shareholders after all of the other creditors have been satisfied. Banks and bank loans are generally senior claimants to bondholders who are senior claimants to the equity holders. It is the contingent nature of the equity claim on the firm's cash flow that accounts for its higher degree of risk and also its potentially higher return.*

It is natural to think that assets with large expected returns are good and one should buy more of them. But the logic actually goes the other way. Good assets pay off well in bad times when investors really need/want them and have a positive covariance. Since all investors want them, they get lower average returns and command higher average prices. Bad assets with high average returns are forced to make higher payoffs or suffer lower prices because they pay off badly at times when investors most want them.

It's important for investors to consider all sources of risk in their portfolio. It is also important for investors to realize that individual securities in a portfolio must not be assessed in isolation but in terms of their contribution to total portfolio risk and total portfolio return.

* One well-known technique for pricing securities is referred to as contingent-claims pricing (Merton 1973).

Brett Hammond, Leo Kamp and Douglas Fore are available to comment on economic data. If you wish to speak with them, please contact Chad Peterson, Media Relations, 212-916-4808 or email cpeterson@tiaa-cref.org.

C41926 (0004)