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BUY THE NUMBERS

Asset Class Correlations

Fall 2006

An Ongoing Supplement to:
All About Asset Allocation
By Richard A. Ferri, CFA

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INTRODUCTION

Correlation analysis is an important step in developing an asset allocation based on Modern Portfolio Theory (MPT). Ideally, a well-diversified portfolio holds investments that individually have high return expectations while exhibiting negative or non-correlation with other investments. A portfolio that holds several investments that have low correlation with each other smoothes the period to period return without sacrificing long-term performance. Annual rebalancing of those investments back to their Investment Policy target further reduces risk and increases return.

The first step in asset allocation is to isolate asset classes that may work well together in a portfolio. Potential asset classes have certain characteristics; 1) adequate market depth to achieve broad diversification, 2) mutually exclusive or near mutually exclusive from other asset classes, 3) available to investors in a low cost way such as in an index fund, and 4) has high liquidity and minimal trading costs.

It should be noted that low correlation does not always increase return and lower risk. In several cases there is no benefit from adding a low correlation asset class to a portfolio because that asset class does not have the prospect of higher returns. Commodities are one example shown in this report.

The lesson learned from this data is that low or negative correlation is useful when selecting investments, but it can be deceiving. Correlation alone is not enough to warrant inclusion of an investment in a portfolio. Other factors need to be considered including expected rate of return, availability, and investment cost.

BUY THE NUMBERS: Asset Class Correlations illustrate a series of rolling 36-month correlation coefficients and 36-month rolling return comparisons between various asset classes, styles, and categories. Rolling correlations are more insightful than the typical long-term correlation matrices found in textbooks. Rolling correlations illustrate the changes that occur between asset classes over time rather than a flat measure covering a long-term period.

We hope you find this report useful in making portfolio allocation decisions. An appendix is provided that explains correlation analysis and why it is useful.

BUY THE NUMBERS: Asset Class Correlations is updated on a quarterly basis.

To learn more about asset allocation and correlation, order:

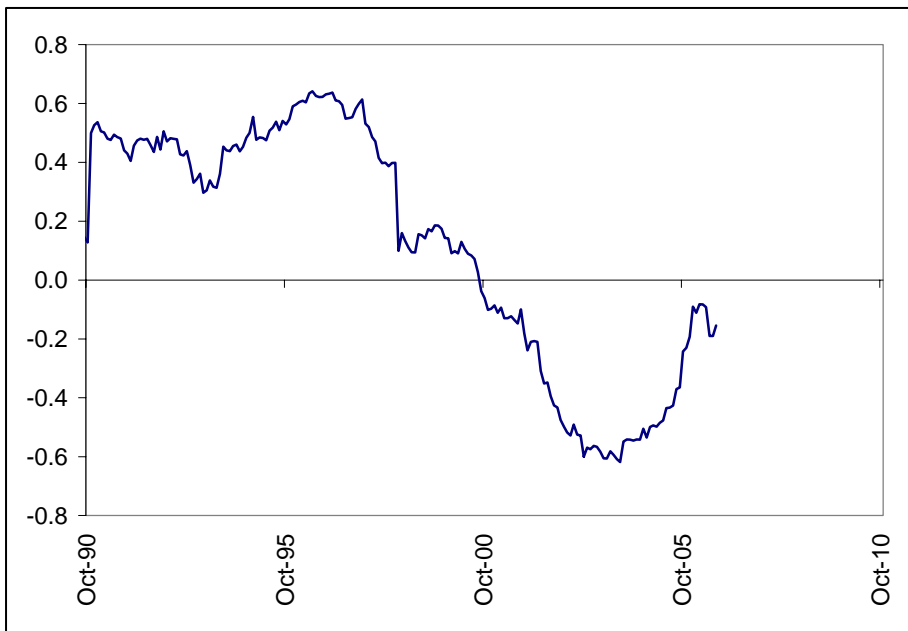
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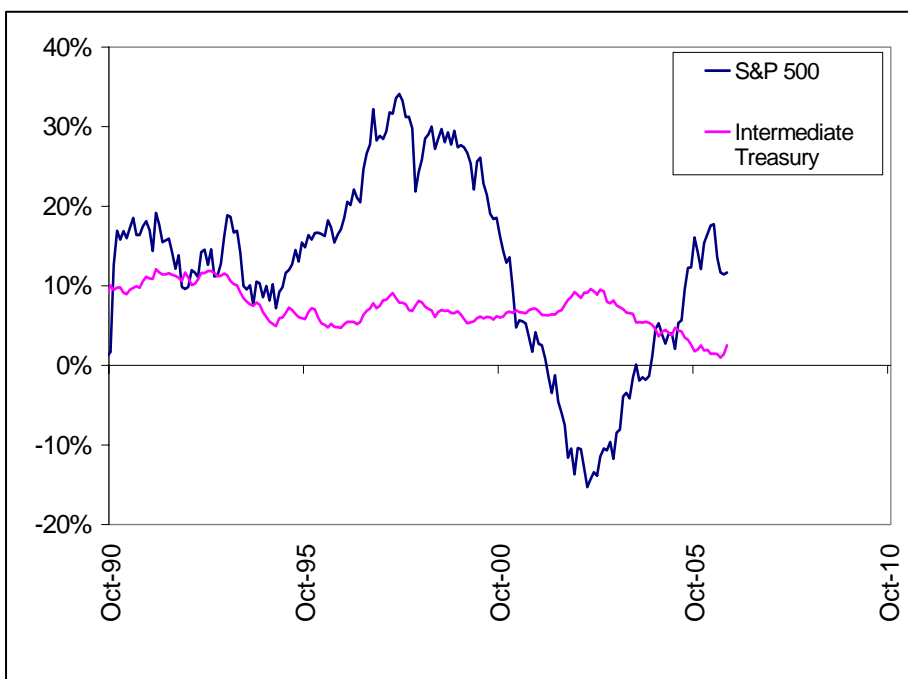
Intermediate US Treasuries and the S&P 500 Index

The figures below illustrate: 1) the rolling 36-month correlation between the S&P 500 Index and the Lehman Brothers Intermediate Treasury Index, and 2) the rolling 36-month annualized return between the two benchmarks.

Case in point: asset classes can have negative correlation and the same returns or similar returns.



The 36-month rolling correlation between U.S. stocks and Treasury bonds remains slightly negative.

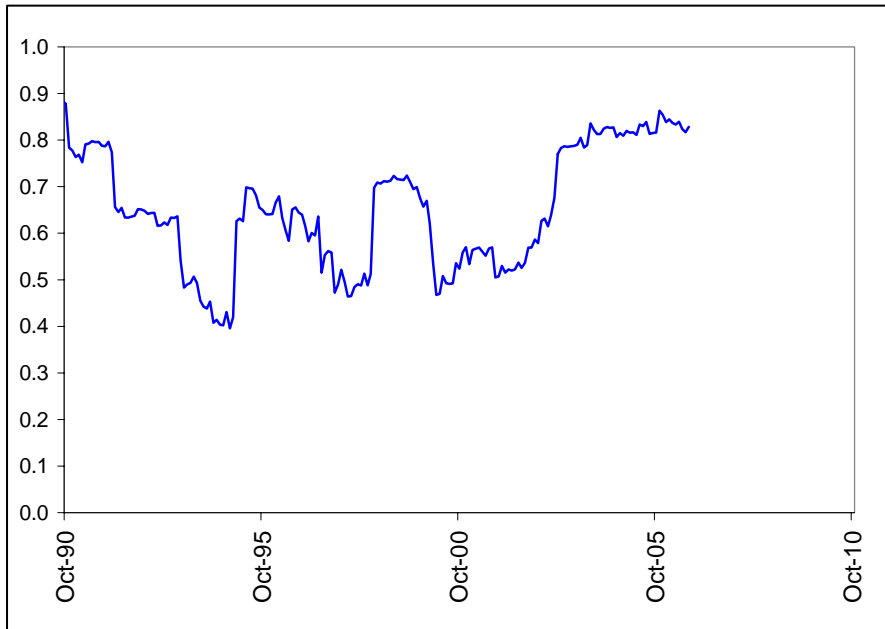


Stocks have handily beat bonds using a 36-month rolling annualized return.

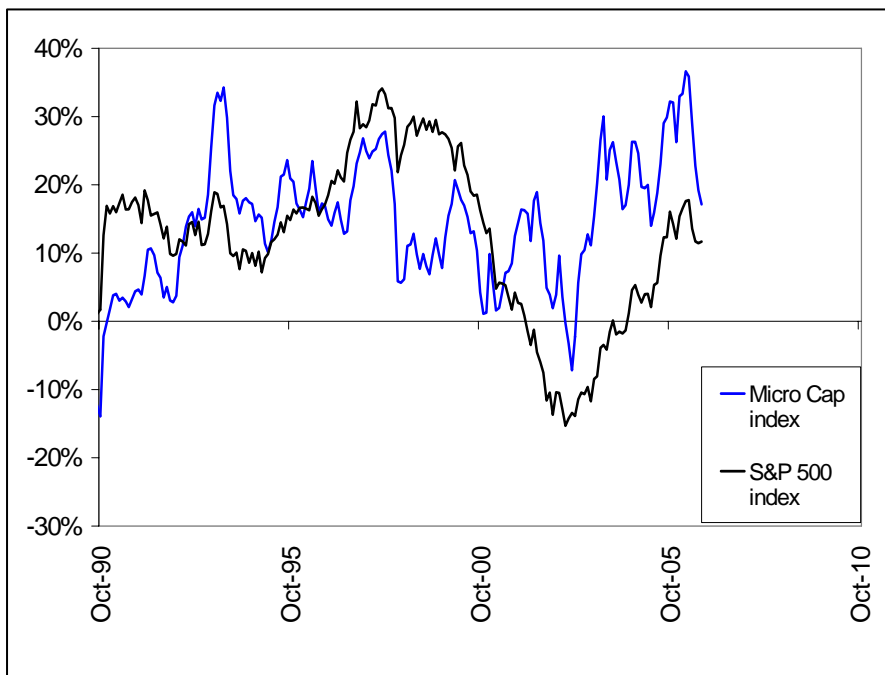
Size Correlations in the U.S. Equities Market

Although micro cap stocks are only a fraction of the total market capitalization, they represent about 50 percent of all actively traded stocks. The top figure illustrates the rolling 36-month correlation between the **S&P 500 Index** and the **Wilshire Micro Cap Index** and the bottom figure is the 36-month rolling annualized returns.

Case in point: asset classes can have positive correlation and widely different returns.



The rolling 36-month correlation between micro and large stocks is still high.

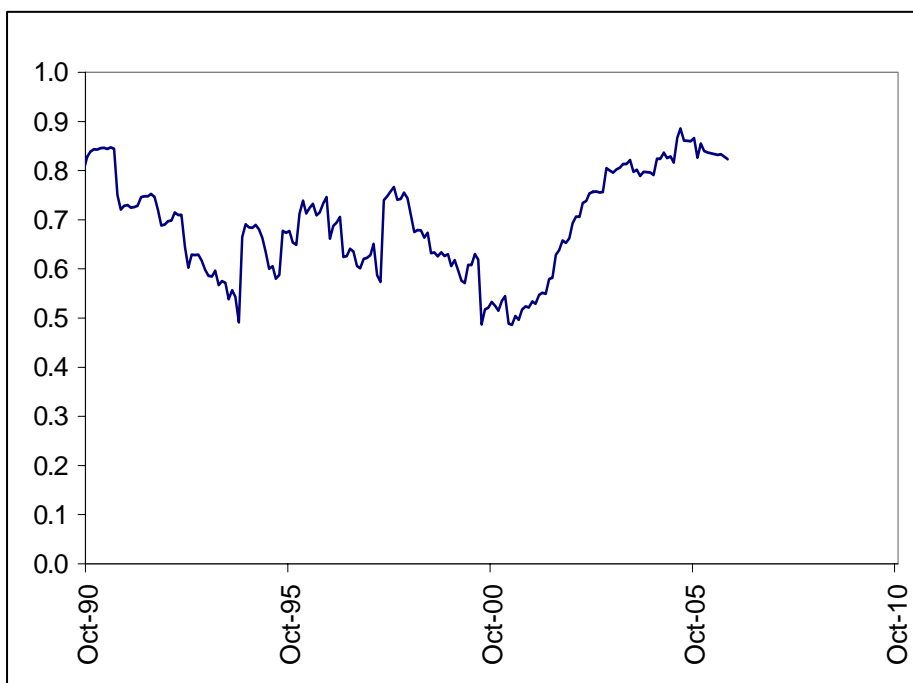


The rolling 36-month annualized return of micro has decreased and it is now close to the S&P 500.

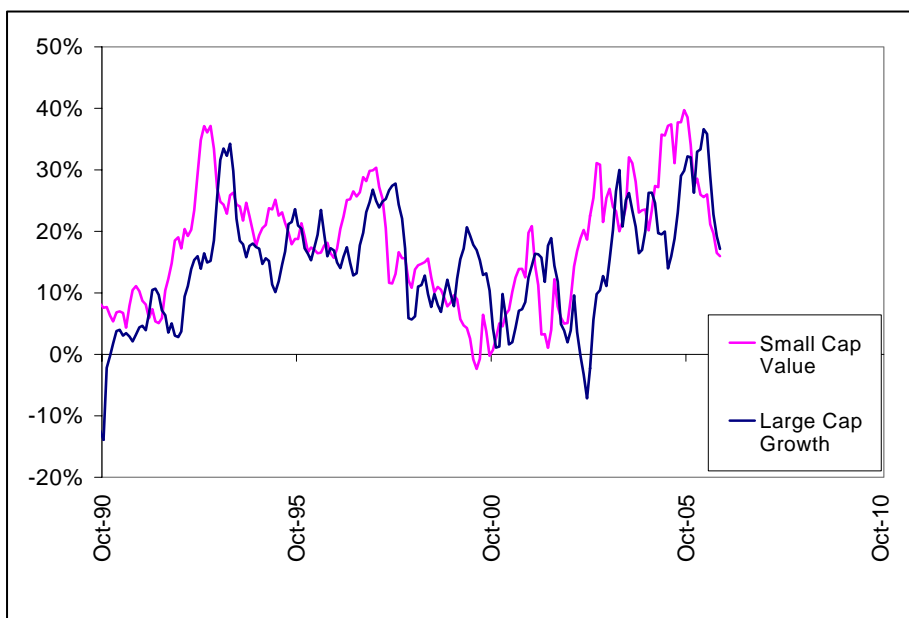
Style Correlations in the U.S. Equities Market

The US stock market is traditionally weighted to large cap growth companies. Dividing the market by growth and value styles can yield some interesting data. The figures below illustrate the 36-month rolling correlation and return between two opposing size and style indexes; a large growth stock index and a small value index. A diversification benefit is gained by adding small value to large growth.

Another example of two investments with high positive correlation but sometimes widely different returns, thus providing good diversification potential.



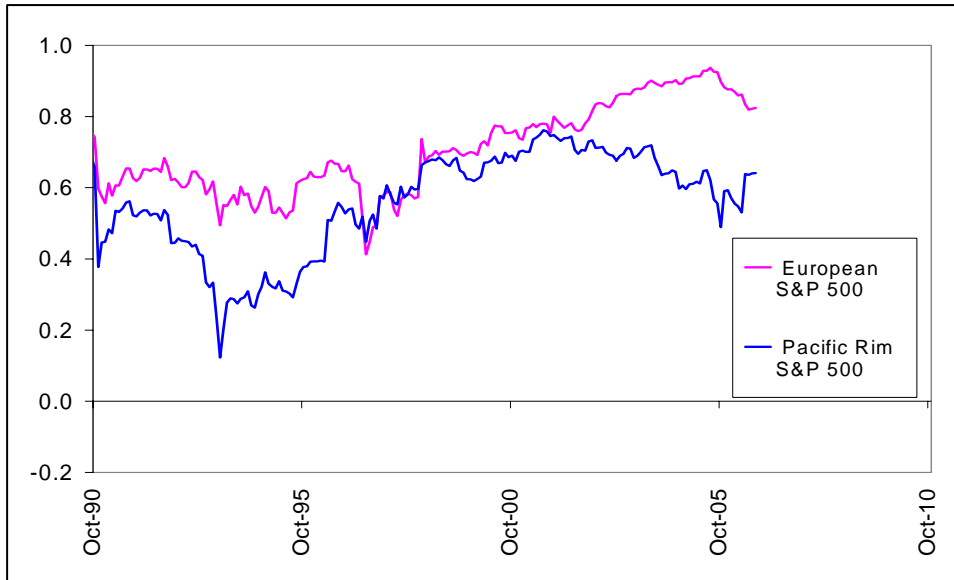
The rolling 12-month correlation between the Russell 1000 Large Growth and Russell 2000 Small Value indexes seems to have peaked around June 2005, but still remain high.



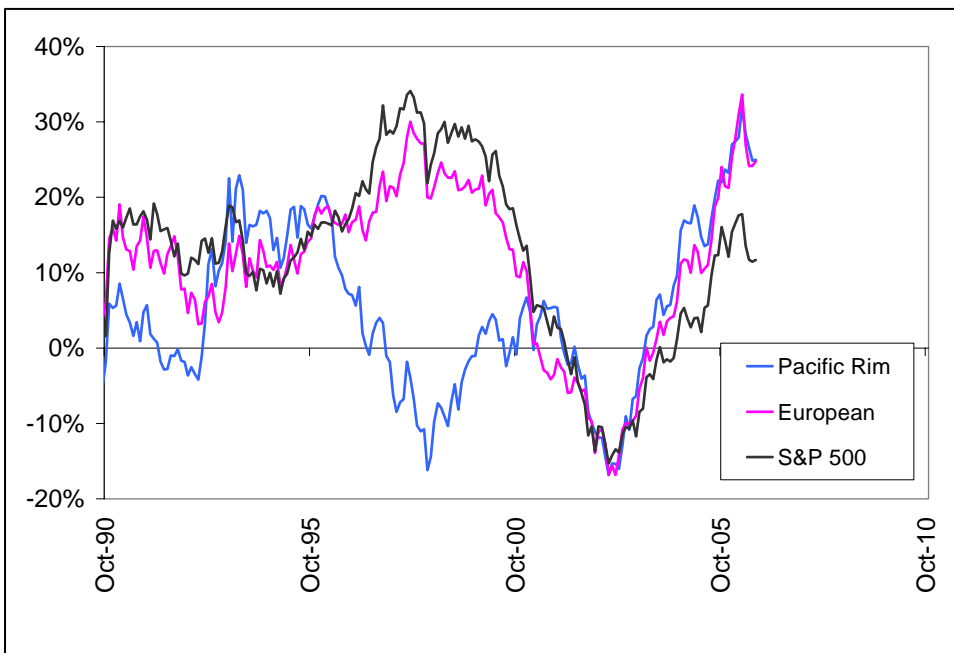
The 36-month annualized returns of between small cap value and large cap growth are almost equal.

Foreign Stock Correlation to U.S. Stocks

Foreign stock markets offer diversification benefits to investors. The world economy is correlated to an extent, and that correlation is reflected in the returns from stock markets around the world. Currency fluctuations between countries also contribute to the diversification benefits. The top figure illustrates the rolling 36-month annualized correlations between the S&P 500, the MSCI Pacific Index, and the MSCI European Index. The bottom figure illustrates the rolling 36-month returns of those indexes.



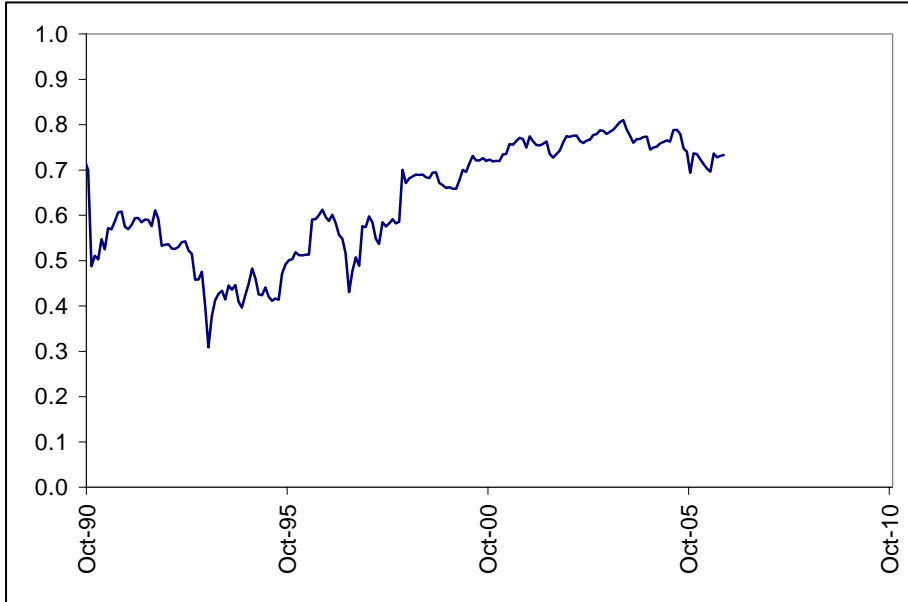
The correlation between the U.S. and Pacific, and U.S. and European stocks differs. U.S. and Europe is decreasing and U.S. and Pacific is increasing.



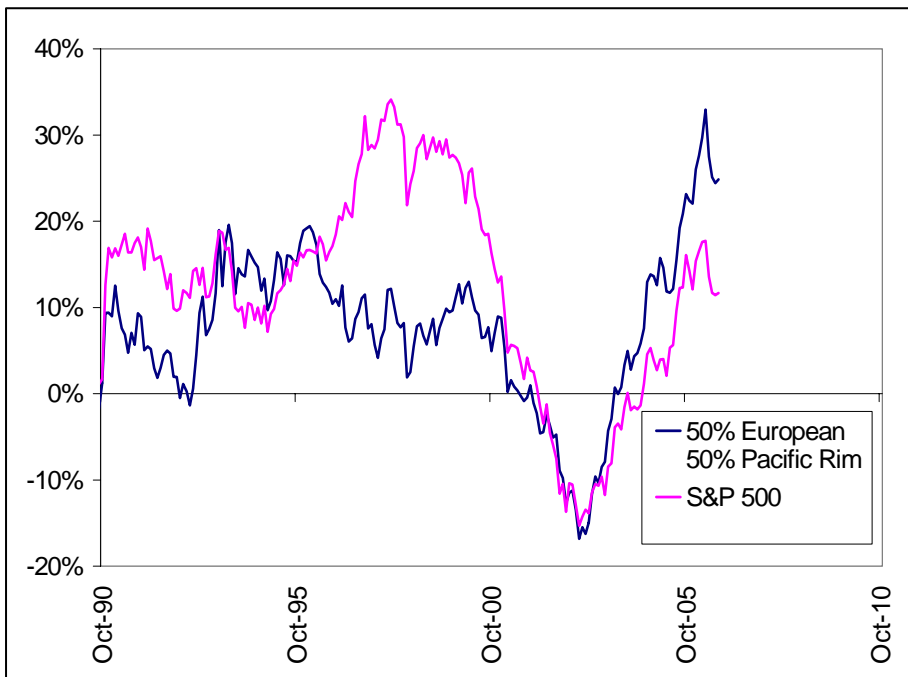
The rolling 36-month returns of European stocks and Pacific Rim stocks are higher than the U.S., however all three have decreased slightly over the last few months.

An Equal Weighted European and Pacific Rim Portfolio

The figures below illustrates the rolling 36-month rolling correlation and returns of the S&P 500 compared to a foreign stock portfolio composed of 50 percent in the MSCI Pacific Index and 50 percent in the MSCI European Index.



The correlation between U.S. stocks and an equal weight in European and Pacific Rim stocks has been relatively stable, over the past three months.

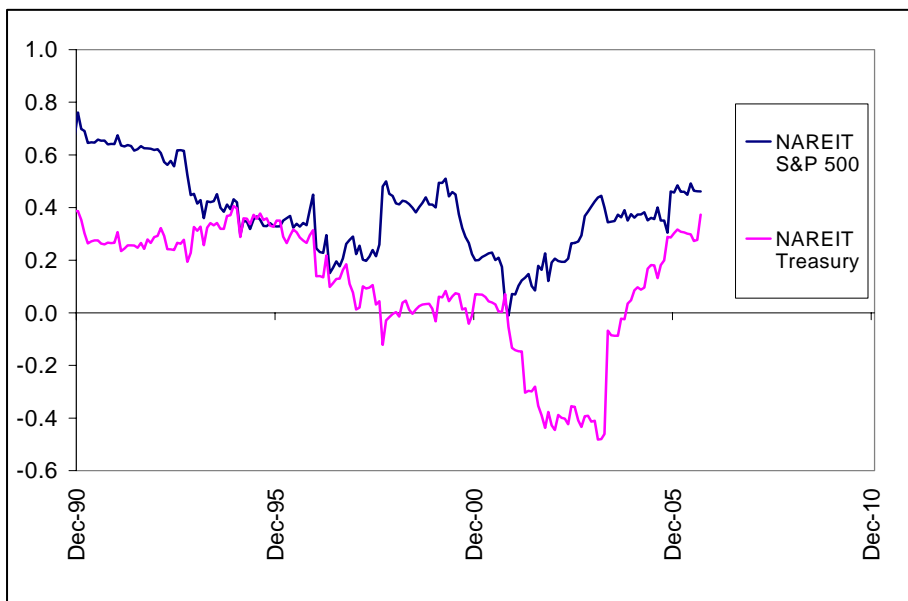


However, the rolling 36-month returns are not as stable with each other, signaling a continued diversification benefit.

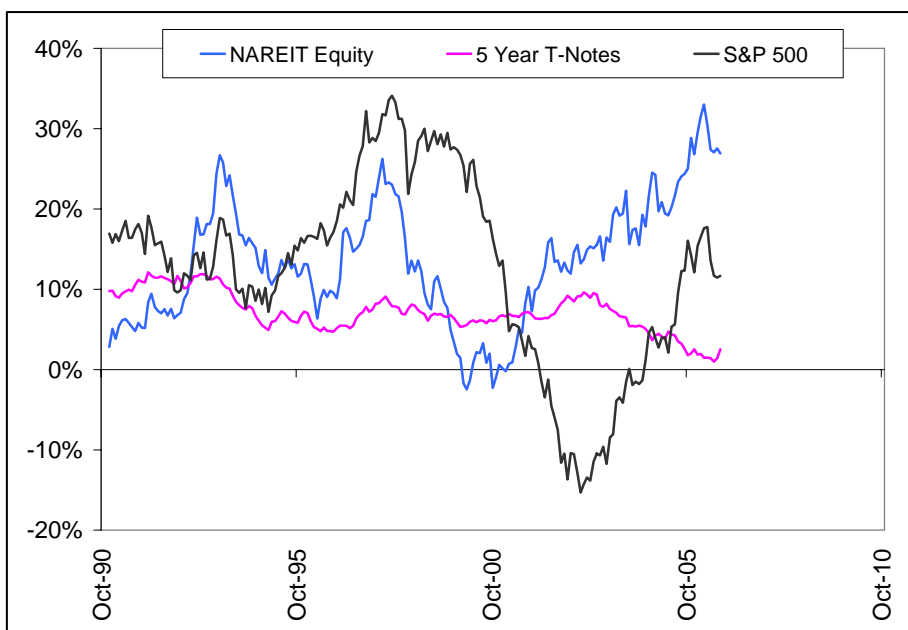
Real Estate Investment Trusts (REITs) as an Asset Class

Real estate is an important part of the U.S. economy. Equity Real Estate Investment Trusts (REITs) are publicly traded baskets of managed commercial real estate. A tax law change in the early 1990s formed the catalyst for an explosion in the REIT market. It allowed pension trusts to take a much larger position in real estate investment without violating trust law. Many people believe that REITs follow the returns of interest rates while others believe REITs follow the returns of common stocks. The figures below suggest that neither is true.

Case in point: low correlation can be a significant factor in asset selection if an adequate return from the asset class is also expected.



The rolling 36-month correlation between both REITs and bonds and stocks are now positive.

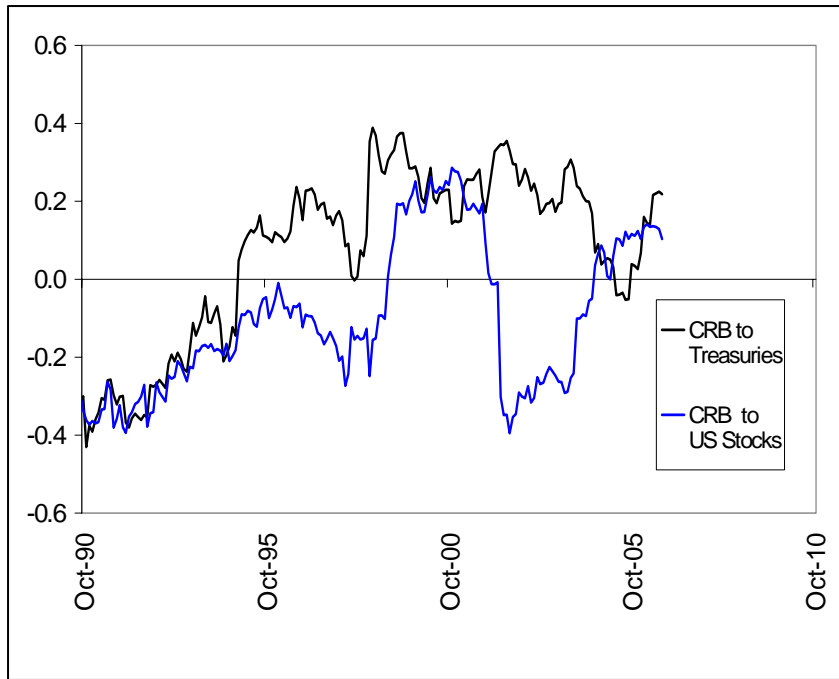


There has been a significant benefit to holding REITs in addition to stocks and bonds during the last three years.

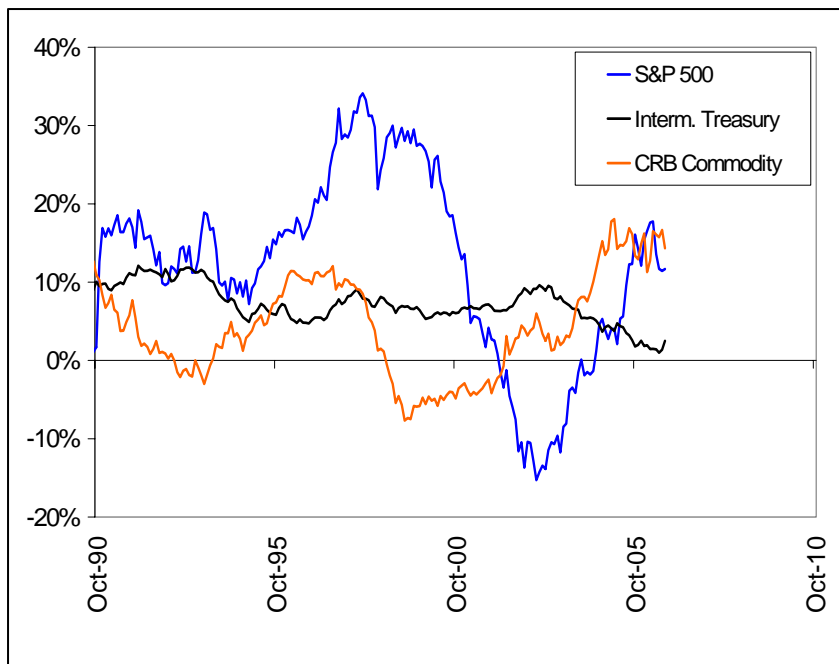
Commodities as an Asset Class

There is an ongoing debate in the investment community as to the use of commodities as an asset class. On one side, investors point to the low correlation between commodities and other asset classes as the reason to include commodities. On the other side of the debate, investors point to the low expected returns from commodities. The long-term return of the asset class has been below the inflation rate.

The commodities index we used is the Reuters CRB Total Return Index. It represents the total collateralized return of an equally weighted basket of 17 near-term commodities futures. We have chosen the CRB index because it is not heavily skewed to oil and energy.



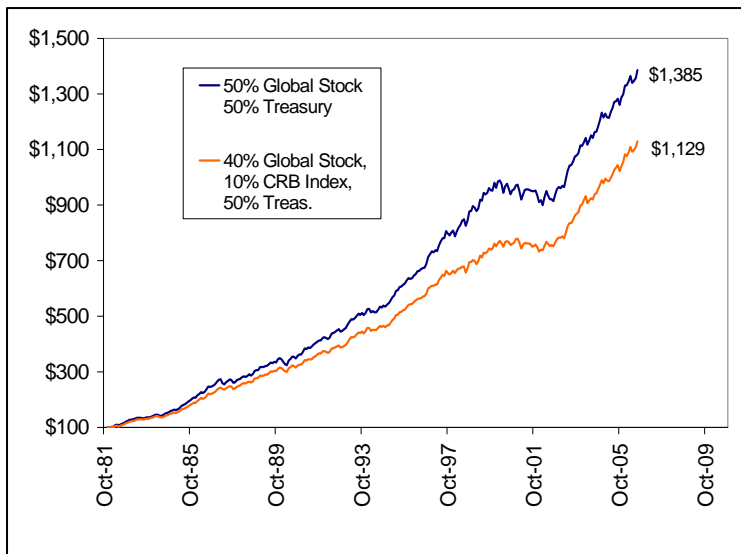
There has been a negligible 36-month correlation between the CRB, US stocks and bonds over the years. Proponents say the low and negative periods of correlation are the reason to own this asset class, we disagree.



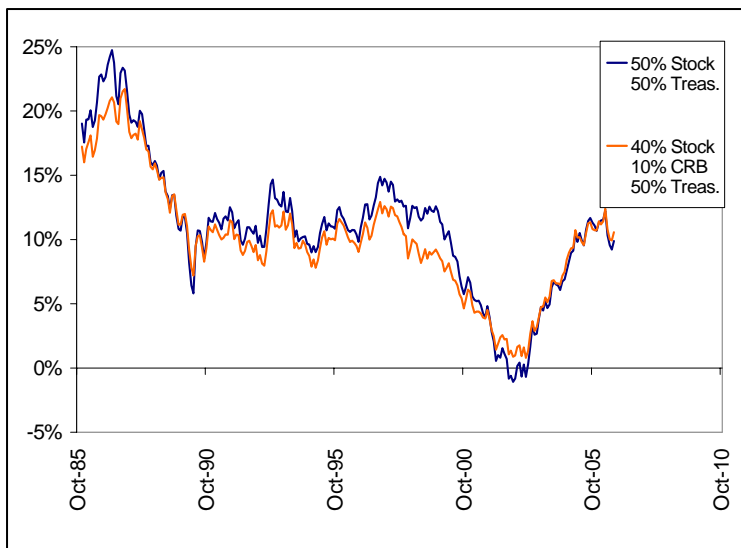
During the last few years, the rolling 36-month return of the CRB equaled the returns of stocks and outperformed bonds. Currently it is outperforming both stocks and bonds. That is typically not the case. Commodities have an expected return of 0% after inflation.

Measuring Returns of Portfolios With and Without Commodities

We created two portfolios and measured the returns. One portfolio consisted of 50% global stocks and 50% Treasuries (stock indexes used were 25% Wilshire 5000, 10% MSCI Europe, 10% MSCI Pacific, and 5% NAREIT). The other portfolio consisted of 40% global stocks, 10% CRB Total Return Index, and 50% Treasuries (stock indexes used were 15% Wilshire 5000, 10% MSCI Europe, 10% MSCI Pacific, and 5% NAREIT). Both portfolios were rebalanced annually.



Commodities lower the long-term return of a stock and bond portfolio. Starting with \$100 in Dec. 1982, the portfolio with commodities returned \$256 less than the portfolio without commodities. The portfolio without commodities returned about 1% more than the one with commodities.



To the left is the rolling 3-year annualized returns of the two portfolios. Since the inception of the CRB total return index there was one brief period where commodities helped a portfolio. During the rest of the time periods, commodities have hurt performance.

The lesson learned from this data is that low or negative correlation is useful when selecting investments, but should not be the sole factor. Other factors need to be considered including expected return of the asset class, the ability to achieve broad diversification at a reasonable cost, liquidity, and taxes.

APPENDIX

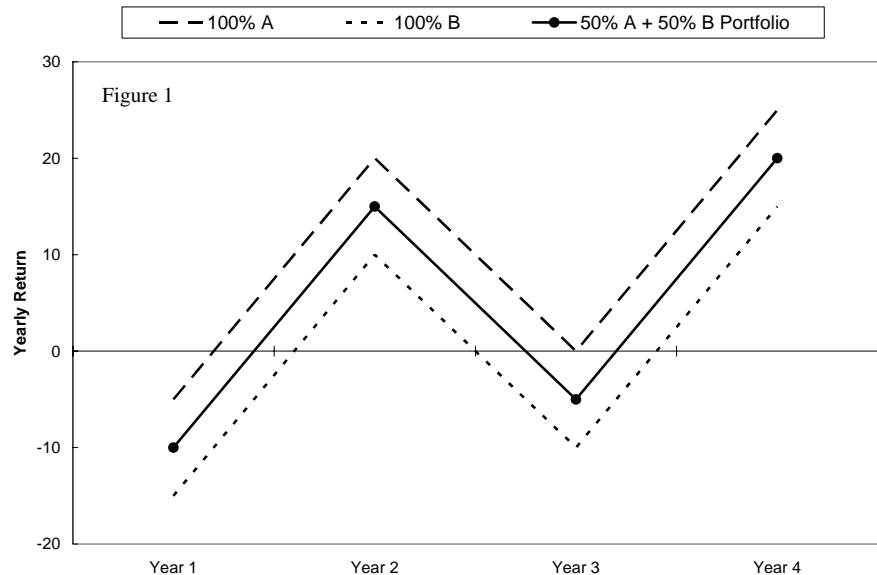
CORRELATION EXPLAINED

Correlation is a mathematical measure of the tendency of one investment to move in relation with another. The correlation coefficient is a mathematically derived number that measures this tendency toward co-movement. If two investments move in the same direction at the same time, they have *positive correlation*. If they move in opposite directions at the same time, they have *negative correlation*. If the movement of one investment is independent of the movement of the other, they are *non-correlated*.

The challenge facing investors is to find investments that have negative correlation, noncorrelation, or low positive correlation with each other. Once those investments have been identified, investors should place an appropriate percentage of their portfolio in each one, and rebalance those investments annually.

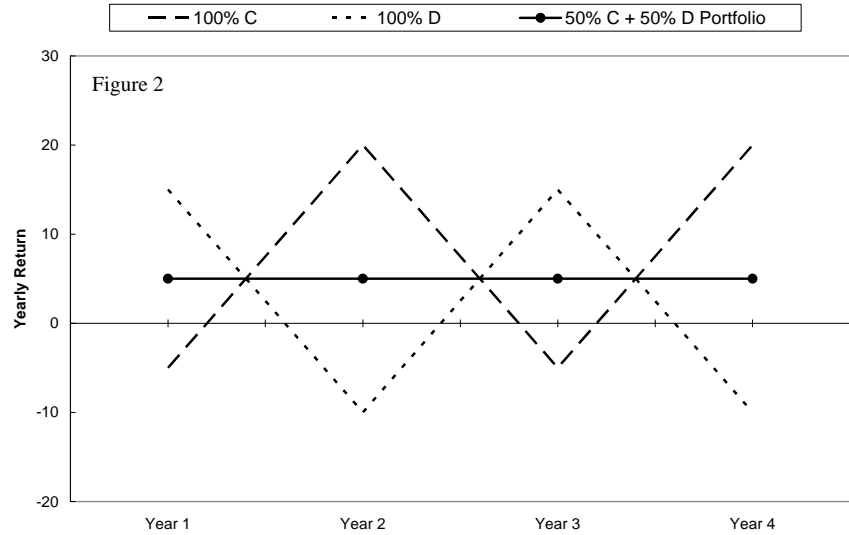
There is no benefit gained by purchasing investments that have a consistently high positive correlation with other investments. Nonetheless, this is a very common mistake that people make. During the late 1990s, many investors thought they were diversifying their portfolios by purchasing several different growth mutual funds; however, all those funds were heavily weighed in the same group of technology and communications stocks. When the technology and communications sectors of the economy fell between 2000 and 2002, all growth mutual funds collapsed concurrently.

Figure 1 illustrates the movement in the returns of two mutual funds that have a consistently high correlation with each other. Figure 1 assumes a portfolio of 50 percent in Fund A and 50 percent in Fund B, rebalanced annually. Since Fund A and Fund B are perfect positively correlated, there would be no diversification benefit from owning both in a portfolio.

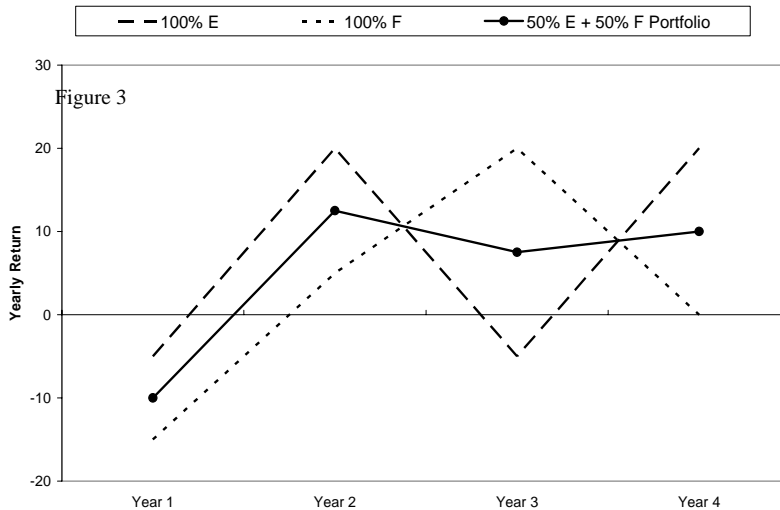


Ideally, you would like to invest in two mutual funds that have negative correlation. Figure 2 on the next page shows that Fund C and Fund D move in opposite directions, which means that the two funds have negative correlation.

A portfolio of 50 percent in Fund C and 50 percent in Fund D, rebalanced annually, will result in a return that is less volatile than the return on either of the two investments individually. Negative correlation is ideal when selecting investments for a portfolio, but it is very difficult to find.



Correlation is measured using a range between +1.0 and -1.0. For all practical uses, when two investments that have a correlation of +0.3 or greater they are considered positively correlated. When they have a correlation of -0.3 or less the investments are considered negatively correlated. A correlation coefficient between -0.3 and +0.3 is considered non-correlated.



When two investments are non-correlated, the movement of one does not affect the movement of the other, or the tracking is inconsistent and shifts between positive and negative. The figure to the left illustrates investments that are not correlated. At times they move together and other times they do not. There is a diversification benefit of owning non-correlated investments.

CORRELATIONS ARE NOT STATIC

Most correlation studies focus on finding the long-term relationship between asset classes. The result of those studies is typically presented in a matrix that compares the average correlations of all asset classes over a long-term period. Here is an example of a correlation matrix:

| MARKET CORRELATION MATRIX Jan 1979 - Dec 2004 | LB Inter Treasury | S&P 500 Index | Wilshire REIT Index | MSCI EAFE In US\$ |
|--|------------------------------|------------------------------|--------------------------------|----------------------------------|
| LB Inter. Treasury Bond Index | 1.00 | | | |
| S&P 500 Index | 0.16 | 1.00 | | |
| Wilshire Equity REIT Index | 0.16 | 0.49 | 1.00 | |
| MSCI EAFE Index (US\$) | 0.12 | 0.57 | 0.34 | 1.00 |

We believe that long-term average correlation does not capture the dynamics of the marketplace. Matrices such as the one above fail to capture the constant change in correlations that occur between various asset classes. It is important to understand the dynamics of correlation and the magnitude of the changes that can occur between asset classes so you will not be disappointed if asset classes are not performing as expected during all market conditions.

Developing a portfolio that holds assets that have negative correlation or noncorrelation with one another is beneficial. The problem is those investments are difficult to find. When you believe you may have found a negatively correlated investment, the correlation changes and becomes positive.

Most portfolios will be composed of investments that have varying correlation with one another. The correlations between some investments are expected to increase while others will decrease. We do not believe it is possible to predict which set of investments will have higher or lower correlations in the future. For that reason we believe a portfolio should hold several investments representing many asset classes and styles. Annual rebalancing of those investment back to their planned target allocation will reduce help reduce overall portfolio risk and increase long-term returns.

To learn more about asset allocation and correlation, order:

[*All About Asset Allocation*](#)

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- Asset Class Correlations** – charts changing dynamics between asset class returns.

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