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Do Your Assets Correlate?

Asset correlation is commonly mentioned in investment discussions but seldom explained in detail — even though it is critical for any diversification strategy.

Allocating to different assets (such as stocks and bonds) that tend to move up and down under different market conditions may help you offset one asset's falling returns with another's rising returns. This is the basic idea behind asset correlation, a strategy designed to potentially lower investment volatility, with the goal of improving the portfolio's diversification.

How Asset Correlation Works

In portfolio management theory, correlation statistically captures the relationship between two variables. It shows whether, and how strongly, selected assets are related.

“Correlation measures the strength of the historical relationship between two securities' returns,” says Leonard Govia, participant advice manager, TIAA-CREF. “It measures how much the returns of any two or more securities are related, but does not imply that the movement of one security causes the movement of another, or that this relationship will exist in the future.” (“Securities” is another word for investments.)

Correlation ranges from +1.0 to -1.0, where +1.0 equals perfect *positive correlation*, -1.0 equals perfect *negative correlation* and 0.0 equals zero correlation.

To see how asset correlation works, let's consider a few examples of hypothetical mutual funds performing alone and in combination over an imaginary period of time. In our examples, we'll examine three tables in which four mutual funds' risks are represented by their hypothetical standard deviation, which measures a security's volatility, that is, its tendency to rise or fall sharply from a relative performance level. To simplify the discussion, we'll examine two funds at a time. When the funds are combined in a portfolio, it will consist of a 50% allocation to each fund.

Positive Correlation

Assets with a perfect positive correlation have a perfect linear relationship, which means that by knowing how the return of one security behaves (rises or falls), you will be better able to forecast what the other security will do. For example, if security A's return goes up, you can expect security B's return to rise as well; you just can't know by how much.

As you see in Table 1 below, hypothetical mutual funds A and B have identical returns over a six-year period and have perfect positive correlation. This means that when fund A's return goes up fund B's does also, and when fund A's return drops, so does B's.

Table 1. Positively Correlated Funds

Year	Fund A	Fund B	Portfolio AB
1	32%	32%	32%
2	-11%	-11%	-11%
3	-14%	-14%	-14%
4	33%	33%	33%
5	-8%	-8%	-8%
6	28%	28%	28%
Avg. Return	10%	10%	10%
Standard Deviation	23%	23%	23%

Table 1 also illustrates that the hypothetical portfolio combination of funds A and B has exactly the same overall return as does either fund by itself. The risk of this portfolio, as measured by the standard deviation, is identical to the standard deviation of either fund alone, so there's no variation in the returns or standard deviation. The lesson here is that having these two funds in your portfolio will not reduce your investment risk.

Negative Correlation

With perfect negative correlation, the funds' returns move opposite to each other. If one fund has a positive return, you can anticipate that the other fund will have a negative return. This dynamic relationship is illustrated in Table 2, which shows that when one fund's return is higher, the other's is correspondingly lower.

Table 2. Negatively Correlated Funds

Year	Fund A	Fund C	Portfolio AC
1	32%	-12%	10%
2	-11%	31%	10%
3	-14%	34%	10%
4	33%	-13%	10%
5	-8%	28%	10%
6	28%	-9%	10%
Avg. Return	10%	10%	10%
Standard Deviation	23%	23%	0%

In Table 2, hypothetical funds A and C are perfectly correlated negatively and have the same return (10%) and the same standard deviation (23%). But when combined into portfolio AC,

their deviations around their 10% individual returns cancel out. This means that with the hypothetical AC portfolio you can achieve the target return of 10% while eliminating the risk, as indicated by AC's 0% standard deviation.

Zero Correlation

With zero correlation, there's no relationship between the returns of the selected securities. As a result, the returns of one security are not an indicator of the returns of another. For this reason, we don't include a table with zero correlated funds.

Correlation and Diversification

Since investors use correlation to improve diversification, the important question is: When can diversification help a portfolio by reducing risk? The general advice is:

- When you combine two or more funds with perfect positive correlation, there's no reduction of portfolio risk. The risk of the resulting portfolio is simply an average of the individual risks of the two funds. If you add more funds, or securities that are in perfect positive correlation, the portfolio will continue to produce an average return without reducing risk. Such an allocation would not help reduce your portfolio risk.
- If you combine two or more funds that have zero correlation, portfolio risk may be reduced, since the funds move independently and are statistically unrelated. If you add more uncorrelated funds or securities to the portfolio, you may be able to reduce risk, but not eliminate it completely. The advantage of this allocation strategy, however, is that it would help reduce your portfolio risk.
- If you combine two or more funds with perfect negative correlation, you could eliminate risk altogether for an ideal portfolio. This is what all investors want, of course.

In the real world, however, extreme correlations like those illustrated in Tables 1 and 2 are rare. Typically, securities have some positive correlation with each other because investment markets are generally interrelated. Ideally, you'd like to set up a portfolio that's negatively correlated or with very low positive correlation.

Table 3 illustrates the more likely real-world scenario of positively correlated hypothetical funds A and D, which have identical standard deviations of 23% and average returns of 10% separately.

Table 3. A Real-World Example

Year	Fund A	Fund D	Portfolio AD
1	32%	23%	28%
2	-11%	25%	7%
3	-14%	18%	2%

4	33%	17%	25%
5	-8%	-35%	-22%
6	28%	11%	20%
Avg. Return	10%	10%	10%
Standard Deviation	23%	23%	18%

When these funds are combined into portfolio AD, portfolio risk is reduced, as indicated by the lower 18% standard deviation. This would be a worthwhile allocation, since it would give you the targeted 10% return while lowering portfolio risk from 23% to 18%.

All in all, then, “these simple hypothetical examples show that by diversifying among a few assets that behave differently, you can improve your portfolio by reducing its overall risk,” says Govia.

There are simple techniques you can use to accomplish this. Bond funds, for example, tend to correlate negatively with stock funds, while guaranteed accounts and real estate accounts have little or no correlation with each other, or with any other asset class.

To learn more about asset allocation and diversification, visit our Asset Allocation Evaluator in the “Planning Tools” section of our website, www.tiaa-cref.org.

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