

Beta

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What Is Beta?

Beta is a measure of the volatility—or [systematic risk](#)—of a security or portfolio compared to the market as a whole. Beta is used in the [capital asset pricing model](#) (CAPM), which describes the relationship between systematic risk and expected return for assets (usually stocks). CAPM is widely used as a method for pricing risky securities and for generating estimates of the expected returns of assets, considering both the risk of those assets and the cost of capital.

Key Takeaways

- Beta, primarily used in the capital asset pricing model (CAPM), is a measure of the volatility—or systematic risk—of a security or portfolio compared to the market as a whole.
- Beta data about an individual stock can only provide an investor with an approximation of how much risk the stock will add to a (presumably) diversified portfolio.
- For beta to be meaningful, the stock should be related to the benchmark that is used in the calculation.

How Beta Works

A [beta](#) coefficient can measure the volatility of an individual stock compared to the systematic risk of the entire market. In statistical terms, beta represents the slope of the line through a regression of data points. In finance, each of these data points represents an individual stock's returns against those of the market as a whole.

Beta effectively describes the activity of a security's returns as it responds to swings in the market. A security's beta is calculated by dividing the product of the [covariance](#) of the security's returns and the market's returns by the [variance](#) of the market's returns over a specified period.

The calculation for beta is as follows:

$$\text{Beta coefficient}(\beta) = \frac{\text{Covariance}(R_e, R_m)}{\text{Variance}(R_m)}$$

where:

R_e = the return on an individual stock

R_m = the return on the overall market

Covariance = how changes in a stock's returns are related to changes in the market's returns

Variance = how far the market's data points spread out from their average value

The beta calculation is used to help investors understand whether a stock moves in the same direction as the rest of the market. It also provides insights about how volatile—or how risky—a stock is relative to the rest of the market. For beta to provide any useful insight, the market that is used as a benchmark should be related to the stock. For example, calculating a bond ETF's beta using the S&P 500 as the benchmark would not provide much helpful insight for an investor because bonds and stocks are too dissimilar.

Ultimately, an investor is using beta to try to gauge how much risk a stock is adding to a portfolio. While a stock that deviates very little from the market doesn't add a lot of risk to a portfolio, it also doesn't increase the potential for greater returns.

In order to make sure that a specific stock is being compared to the right benchmark, it should have a high R-squared value in relation to the benchmark. [R-squared](#) is a statistical measure that shows the percentage of a security's historical price movements that can be explained by movements in the benchmark index. When using beta to determine the degree of systematic risk, a security with a high R-squared value, in relation to its benchmark, could indicate a more relevant benchmark.

For example, a gold [exchange-traded fund \(ETF\)](#), such as the SPDR Gold Shares ([GLD](#)), is tied to the performance of gold bullion.¹ Consequently, a gold ETF would have a low beta and R-squared relationship with the S&P 500.

One way for a stock investor to think about risk is to split it into two categories. The first category is called systematic risk, which is the risk of the entire market declining. The [financial crisis in 2008](#) is an example of a systematic-risk event; no amount of [diversification](#) could have prevented investors from losing value in their stock portfolios. Systematic risk is also known as un-diversifiable risk.

[Unsystematic risk](#), also known as diversifiable risk, is the uncertainty associated with an individual stock or industry. For example, the surprise announcement that the company Lumber

Liquidators ([LL](#)) had been selling hardwood flooring with dangerous levels of formaldehyde in 2015 is an example of unsystematic risk.² It was risk that was specific to that company. Unsystematic risk can be partially mitigated through diversification.

Types of Beta Values

Beta Value Equal to 1.0

If a stock has a beta of 1.0, it indicates that its price activity is strongly correlated with the market. A stock with a beta of 1.0 has systematic risk. However, the beta calculation can't detect any unsystematic risk. Adding a stock to a portfolio with a beta of 1.0 doesn't add any risk to the portfolio, but it also doesn't increase the likelihood that the portfolio will provide an excess return.

Beta Value Less Than One

A beta value that is less than 1.0 means that the security is theoretically less volatile than the market. Including this stock in a portfolio makes it less risky than the same portfolio without the stock. For example, utility stocks often have low betas because they tend to move more slowly than market averages.

Beta Value Greater Than One

A beta that is greater than 1.0 indicates that the security's price is theoretically more volatile than the market. For example, if a stock's beta is 1.2, it is assumed to be 20% more volatile than the market. Technology stocks and small cap stocks tend to have higher betas than the market benchmark. This indicates that adding the stock to a portfolio will increase the portfolio's risk, but may also increase its expected return.

Negative Beta Value

Some stocks have negative betas. A beta of -1.0 means that the stock is inversely correlated to the market benchmark. This stock could be thought of as an opposite, mirror image of the benchmark's trends. [Put options](#) and [inverse ETFs](#) are designed to have negative betas. There are also a few industry groups, like gold miners, where a negative beta is also common.

Beta in Theory vs. Beta in Practice

The beta coefficient [theory](#) assumes that stock returns are normally distributed from a statistical perspective. However, financial markets are prone to large surprises. In reality, returns aren't always normally distributed. Therefore, what a stock's beta might predict about a stock's future movement isn't always true.

A stock with a very low beta could have smaller price swings, yet it could still be in a long-term downtrend. So, adding a down-trending stock with a low beta decreases risk in a portfolio only if

the investor defines risk strictly in terms of volatility (rather than as the potential for losses). From a practical perspective, a low beta stock that's experiencing a downtrend isn't likely to improve a portfolio's performance.

Similarly, a high beta stock that is volatile in a mostly upward direction will increase the risk of a portfolio, but it may add gains as well. It's recommended that investors using beta to evaluate a stock also evaluate it from other perspectives—such as fundamental or technical factors—before assuming it will add or remove risk from a portfolio.

Disadvantages of Beta

While beta can offer some useful information when evaluating a stock, it does have some limitations. Beta is useful in determining a security's short-term risk, and for analyzing volatility to arrive at equity costs when using the CAPM. However, since beta is calculated using historical data points, it becomes less meaningful for investors looking to predict a stock's future movements.

Beta is also less useful for long-term investments since a stock's volatility can change significantly from year to year, depending upon the company's growth stage and other factors.