Beta

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What Is Beta?

A beta coefficient is a measure of the volatility, or systematic risk, of an individual stock in comparison to the unsystematic risk of the entire market. In statistical terms, beta represents the slope of the line through a regression of data points from an individual stock's returns against those of the market.

Understanding Beta

Beta Formula and Calculation

Beta is used in the capital asset pricing model (CAPM), which calculates the expected return of an asset using beta and expected market returns. You may want to compare it to the consumption capital asset pricing model (CCAPM) which is an important extension of the concept.

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

What Beta Describes

Beta describes the activity of a security's returns responding 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 beta calculation is used to help investors understand whether a stock moves in the same direction as the rest of the market, and how volatile or risky it is compared to the market. For beta to provide any insight, the "market" used as a benchmark should be related to the stock. For example, calculating a bond ETF's beta by using the S&P 500 as the benchmark isn't helpful because bonds and stocks are too dissimilar.

The benchmark or market return used in the calculation needs to be related to the stock because an investor is trying to gauge how much risk a stock is adding to a portfolio. A stock that deviates very little from the market doesn't add a lot of risk to a portfolio, but it also doesn't increase the theoretical potential for greater returns.

KEY TAKEAWAYS

- A stock's beta or beta coefficient is a measure of a stock or portfolio's level of systematic and unsystematic risk based on in its prior performance.
- The beta of an individual stock only tells an investor theoretically how much risk the stock will add (or potentially subtract) from a diversified portfolio.
- For beta to be meaningful, the stock and the benchmark used in the calculation should be related.
- Using beta to choose stocks is one of the tools to reduce volatility and create a more diversified portfolio.

Using R-Squared for Beta

In order to make sure 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 could be explained by movements in a benchmark index.

For example, a gold exchange-traded fund (ETF), such as the SPDR Gold Shares (GLD), is tied to the performance of gold bullion. Consequently, a gold ETF would have a low beta and R-squared in relation to the S&P 500, for example. When using beta to determine the degree of systematic risk, a security with a high R-squared value, in relation to its benchmark, would increase the accuracy of the beta measurement.

crisis in 2008 is an example of a systematic-risk event when no amount of diversification could prevent investors from losing value in their stock portfolios. systematic risk is also known as un-diversifiable risk.

Unsystematic or diversifiable risks are associated with an individual stock. The surprise announcement that Lumber Liquidators (LL) had been selling hardwood flooring with dangerous levels of formaldehyde in 2015 is an example of an unsystematic risk that was specific to that company. Unsystematic risk can be partially mitigated through diversification.

Deciphering Beta Values

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, but 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.

A beta value of less than 1.0 means that the security is theoretically less volatile than the market, meaning the portfolio is less risky with the stock included than without it. For example, utility stocks often have low betas because they tend to move more slowly than market averages.

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 caps 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 also increase its expected return.

Some stocks even have negative betas. A beta of -1.0 means that the stock is inversely correlated to the market benchmark as if it were an opposite, mirror image of the benchmark's trends. Put options or inverse ETFs are designed to have negative betas but there are a few industry groups, like gold miners, where a negative beta is also common.

A stock with a very low beta could have smaller price swings and yet still be in a long-term downtrend. In this case, adding a down trending stock with a low beta only decreases risk in a portfolio if you define risk as strictly volatility, rather than the potential for losses. From a practical perspective, a low beta stock in 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 add gains as well. Investors using beta to evaluate a stock will also need to evaluate it from other perspectives—such as fundamental or technical factors—before assuming it will add or remove risk from a portfolio.

Limitations of Beta

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

Additionally, because beta relies on historical data, it doesn't factor in any new information on the market, stock or portfolio for which it's used. 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.

Related Terms

How the Consumption Capital Asset Pricing Model Works

The consumption capital asset pricing model is an extension of the capital asset pricing model that focuses on a consumption beta instead of a market beta. more

Understanding Positive Correlation

Positive correlation is a relationship between two variables in which both variables move in tandem. more

Market Portfolio

A market portfolio is a theoretical, diversified group of investments, with each asset weighted in proportion to its total presence in the market. more

What Are Risk Measures?

Risk measures give investors an idea of the volatility of a fund relative to its benchmark index. Discover more about risk measures here. more

Zero-Beta Portfolio

A zero-beta portfolio is constructed to have no systematic risk, or a beta of zero, with performance not correlated to swings in the broader market. more

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