Custom Calculation Data Points

Alpha

A measure of the difference between a portfolio's actual returns and its expected performance, given its level of risk as measured by Beta. A positive Alpha figure indicates the portfolio has performed better than its Beta would predict. In contrast, a negative Alpha indicates the portfolio has underperformed, given the expectations established by Beta.

Alpha is calculated by taking the excess average monthly return of the investment over the risk-free rate and subtracting Beta times the excess average monthly return of the benchmark over the risk-free rate. The equation is as follows:

$$\alpha_M = \bar{R}^e - \beta\bar{B}^e$$

where,

α_M = Monthly measure of Alpha

$\bar{R}^e$ = Average monthly excess return of the investment

$\bar{B}^e$ = Average monthly excess return of the benchmark

β = Beta

The resulting Alpha is in monthly terms, because the average returns for the portfolio and benchmark are monthly averages. Morningstar then annualizes Alpha to put it in annual terms.

$$\alpha_A = 12\alpha_M$$

The same methodology applies for Alpha (non-excess return) except that the raw return is used instead of the excess return. See Excess Return on page 9.

Alpha (non-excess return)

A measure of the difference between a portfolio's actual returns and its expected performance, without factoring in its level of risk as measured by Beta. A positive Alpha figure indicates the portfolio has performed better than its Beta would predict. In contrast, a negative Alpha indicates the portfolio has underperformed, given the expectations established by Beta.

Alpha (non-excess return) is calculated by taking the monthly return of the investment and subtracting Beta times the average monthly return of the benchmark. The equation is as follows:

$$\alpha_M = \bar{R}^e - \beta\bar{B}^e$$

where,

α_M = Monthly measure of Alpha (non-excess)

$\bar{R}^e$ = Average monthly non-excess return of the investment

$\bar{B}^e$ = Average monthly non-excess return of the benchmark

β = Beta

The resulting Alpha (non-excess) is in monthly terms, because the average returns for the portfolio and benchmark are monthly averages. Morningstar then annualizes Alpha (non-excess) to put it in annual terms.

$$\alpha_A = 12\alpha_M$$

The same methodology applies for Alpha except that the excess return is used instead of the raw return.

Appraisal Ratio

The Alpha of the regression unannualized divided by the standard error of the residual standard deviation. In academic terms, it is an abnormal excess return per unit of non-systematic (nondiversifiable) risk taken.

Appraisal Ratio (non-excess return)

The Alpha of the regression unannualized divided by the standard error of the residual standard deviation. In academic terms, it is an abnormal non-excess return per unit of non-systematic (nondiversifiable) risk taken.

Average

The mean of the source data, obtained by dividing the sum of several quantities by their number.

Average Absolute Deviation

The average deviation from the benchmark in absolute terms of the investment's return.

Average Drawdown

The average of the yearly Max Drawdown measures. This statistic serves as a downside risk measure for the Sterling Ratio. The industry standard is to calculate this over a three-year period using monthly data. In this case, the maximum drawdown measures are calculated from months 1–12, then from months 13–24, and finally from months 25–36. The average drawdown is the average of these three maximum drawdown numbers:

$$\text{Avg Drawdown}=\frac{\sum_{t=1}^{N}\text{MaxDrawdown}_t}{N}$$

Where N is the number of years.

Since this statistic is based on yearly numbers, the time period of the analysis must be at least one year and ideally not contain partial years. To accommodate for potential partial years, the formula is generalized as:

$$\text{Avg Drawdown}=\sum_{t=1}^{n}\text{MaxDrawdown}_t \bullet \frac{12}{\text{Tot \# of Months}}$$

Where n is the number of sub-periods where the last sub-period contains the partial year.

Average Gain

The geometric mean of the periods with a gain.

Average Loss

The geometric mean of the periods with a loss.

Average Rolling Period Return

The annualized average return for a period.

Batting Average

The measure of a manager's ability to consistently beat the market. It is calculated by dividing the number of months in which the manager beat or matched an index by the total number of months in the period. For example, a manager who meets or outperforms the market every month in a given period would have a batting average of 100. A manager who beats the market half of the time would have a batting average of 50.

Bear Beta

The measure of the sensitivity of a fund's return to negative changes in its benchmark's return.

Bear Correlation

Indicates the strength and direction of a linear relationship between two random variables in a bear market. In general statistical usage, correlation or co-relation refers to the departure of two variables from independence. In this broad sense, several coefficients measure the degree of correlation, adapted to the nature of data.

Best Month

The highest monthly return of the investment since its inception or for as long as Morningstar has data available. This data point defaults to the trailing three-year period (which is the default time period for all custom calculated data), but the user may select a different time period.

Best Month End Date

The highest monthly return of the investment since its inception or for as long as Morningstar has data available. This data point defaults to the trailing three-year period (which is the default time period for all custom calculated data), but the user may select a different time period.

Best Quarter

The highest quarterly (three month) return of the investment since its inception or for as long as Morningstar has data available. This data point defaults to the trailing three-year period (which is the default time period for all custom calculated data), but the user may select a different time period.

Beta

The measure of systematic risk with respect to the risk-free rate. Systematic risk is the tendency of the value of the fund and the value of a benchmark (in this case, the risk-free rate) to move together. Beta is the ratio of what the excess return of the fund would be to the excess return of the risk-free rate if there were no fund-specific sources of return.

If Beta is…	Then…
>1	Movements in value of the fund that are associated with movements in the value of the risk-free rate tend to be amplified.
=1	Movements in value of the fund that are associated with movements in the value of the risk-free rate tend to be the same.
<1	Movements in value of the fund that are associated with movements in the value of the risk-free rate tend to be dampened.

☞ Note: If such movements tend to be in opposite directions, Beta is negative.

Beta is measured as the slope of the regression of the excess return on the fund as the dependent variable and the excess return on the risk-free rate as the independent variable.

The Beta of the market is 1.00 by definition. Morningstar calculates Beta by comparing a portfolio's excess return over T-bills to the risk-free rate's excess return over T-bills, so a Beta of 1.10 shows that the portfolio has performed 10% better than its benchmark in up markets and 10% worse in down markets, assuming all other factors remain constant. Conversely, a Beta of 0.85 indicates that the portfolio's excess return is expected to perform 15% worse than the benchmark's excess return during up markets and 15% better during down markets.

Beta (non-excess return)

The measure of systematic risk with respect to a benchmark. Systematic risk is the tendency of the value of the fund and the value of benchmark to move together. This version of Beta measures the sensitivity of the fund's raw (non-excess) return with respect to the benchmark's raw return that results from their systematic co-movement. It is the ratio of what the raw return of the fund would be to the raw return of the benchmark if there were no fund-specific sources of return.

If Beta is…	Then…
>1	Movements in value of the fund that are associated with movements in the value of the benchmark tend to be amplified.
=1	Movements in value of the fund that are associated with movements in the value of the benchmark tend to be the same.
<1	Movements in value of the fund that are associated with movements in the value of the benchmark tend to be dampened.

☞ Note: If such movements tend to be in opposite directions, Beta is negative.

Beta is measured as the slope of the regression of the excess return on the fund as the dependent variable and the excess return on the benchmark as the independent variable.

The Beta of the market is 1.00 by definition. Morningstar calculates Beta (non excess return) by comparing a portfolio's raw return over T-bills to the benchmark's raw return over T-bills, so a Beta of 1.10 shows that the portfolio has performed 10% better than its benchmark in up markets and 10% worse in down markets, assuming all other factors remain constant. Conversely, a Beta of 0.85 indicates that the portfolio's raw return is expected to perform 15% worse than the benchmark's raw return during up markets and 15% better during down markets.

Bull Beta

A measure of the sensitivity of a fund's return to positive changes in its benchmark's return.

Bull Correlation

Indicates the strength and direction of a linear relationship between two random variables in a bull market. In general statistical usage, correlation or co-relation refers to the departure of two variables from independence. In this broad sense, several coefficients measure the degree of correlation, adapted to the nature of data.

Calmar Ratio

A variation on the Sterling Ratio, this value is used to determine an investment's return, relative to drawdown (downside risk), most commonly used with hedge funds.

The lower the Calmar Ratio, the worse the performance of the investment; the higher the Calmar Ratio, the better the performance. The calculation is the annualized return, divided by the maximum drawdown over the same time period.

Coefficient of Variation

The ratio of the standard deviation to the mean. It is a useful statistic for comparing the volatility from one data series to another, even if the means are drastically different from each other. It puts investments of different return expectations into a comparable measure of risk. The Std Dev data point is not annualized for this calculation.

Correlation

This value reflects the correlation between the returns of two investments, or the excess return of the investments compared to the risk-free rate of return.

Indicates the strength and direction of a linear relationship between two random variables. The value will range between –1 and 1.

A value of 1 indicates a perfect positive dependency and –1 indicates a perfect negative dependency between the two investments.

A correlation value of 0 indicates that no relationship between the two investments exist. The investments are said to be independent of each other.

The correlation is set using the Benchmark under Calculation.

Correlation (non-excess return)

The correlation between the returns of two investments, or the non-excess return of the investments compared to the risk-free rate of return.

Indicates the strength and direction of a linear relationship between two random variables. The value will range between –1 and 1.

A value of 1 indicates a perfect positive dependency and –1 indicates a perfect negative dependency between the two investments.

A correlation value of 0 indicates that no relationship between the two investments exist. The investments are said to be independent of each other.

The correlation is set using the Benchmark under Calculation.

Covariance

A measurement of the degree to which two variables are associated, indicating if changes in one variable are associated with changes in the other. Covariance is positive when variables tend to show similar behavior, where greater values of one variable correspond to greater values of the other. It is negative when variables show opposite behavior, where greater values of one variable correspond to smaller values of the other.

Covariance (non-excess return)

A measure of how much two sets of values show similar behavior, based on non-excess returns. Covariance is positive when variables tend to show similar behavior, where greater values of one variable correspond to greater values of the other. It is negative when variables show opposite behavior, where greater values of one variable correspond to smaller values of the other.

Down Capture Ratio

A measure of a manager's performance in during those period (months or quarters) in which the market return is less than 0. In essence, it tells you what percentage of the down market was captured by the manager. For example, if the ratio is 110%, the manager has captured 110% of the down market and has therefore underperformed the market on the downside.

For example, if a market falls 10%, a fund that has a down capture ratio of 110% will lose 11% in the same time period. If the fund's ratio is less than 110, the fund manager has captured 110 of the down market and therefore has underperformed the market on the downside. The ratio is calculated by dividing the manager's returns by the returns of the index during the down market and multiplying the result by 100.

Down Capture Return

A measure of the manager's performance in periods when the market (benchmark) goes down. This is shown as a percentage value.

Down Number

The number of months in a given time period where an investment's performance was below 0%.

Down Number Ratio

A measure of the number of periods that the investment was down when the benchmark was down, divided by the number of periods that the benchmark was down. The smaller the ratio, the better.

Suppose a fund's benchmark has a return below 0% for nine months of a three-year period and that the fund has a return of less than 0% for twelve months, six of which are in common with the benchmark. The down number ratio is 6 / 9 = 66.7%

Down Percent Ratio

A measure of the number of periods that the investment outperformed the benchmark when the benchmark was down, divided by the number of periods that the benchmark was down. The larger the ratio, the better.

For example, imagine a benchmark that in a three-year period had a return below 0% for six months, and during these down months, a fund outperformed the benchmark three times. The Down Percent Ratio for the fund would be 0.50.

Down Period Percent

The number of months an investment's return was below 0, divided by the total number of months.

For example, if a fund had returns below 0 13 times in a 36-month period, the Down Period Percent would be 36.11%.

Downside Deviation

Measures only deviations below a specified benchmark, even if an investment's returns are positive for a time period. It is also the denominator for the Sortino Ratio. This can be calculated as an annualized or unannualized figure. The equations for each are below:

Unannualized:

$$\sigma_{dd} = \sqrt{\frac{\sum_{i=1}^{T} y_{dd,t}^{2}}{T}}$$

where

$$y_{dd,t} = \min(0, R_t - B_t)$$

i = summation function

dd,t = downside deviation (*dd*) at time (*t*)

min = 0 or the return of the investment minus the return of the benchmark, whichever is lower

R_t = return of the investment product in period t

B_t = return of the benchmark in period t

T = total number of periods

Annualized:

$$\sigma_{dd,A} = \sigma_{dd} \bullet \sqrt{n}$$

where

dd,A = annualized downside deviation

dd = unannualized downside deviation

n = number of periods in a year, e.g., 12 when using monthly data

Downside Std Dev

A measurement of dispersion below an average, expressing how widely the returns of an investment under-perform the benchmark over a certain period of time and how close to the mean they are. It is used as a risk measure of volatility: the closer to the mean, the lower the volatility, meaning the returns are very close to the mean.

Efficiency Ratio (arith)

A risk-reward ratio measuring the average return of an investment (arithmetic mean) over its standard deviation.

Efficiency Ratio (geo)

A risk-reward ratio measuring the average return of an investment (geometric mean) over its standard deviation.

Excess Return

The return of a portfolio in excess of its benchmark where in excess is calculated arithmetically by subtracting the benchmark's return from the portfolio's return in each period.

☞ Note: Excess Return is the same as the standard data point +/- Benchmark.

Excess Return (geo)

The return of a portfolio in excess of its benchmark where in excess is calculated geometrically by subtracting the benchmark's return from the portfolio's return in each period.

First Date

The first date between the start and end dates where Morningstar shown return or portfolio data.

First Value

The first value in the selected source data between the start and end dates.

This data point can be used to display the first NAV for all funds in a category, the first price of a set of stocks, or the initial cash allocation of all funds.

Gain Deviation

A measure of the deviation of the investment's positive returns. It is calculated by finding the square root of the average of the squared positive returns. It is similar to the standard deviation, except gain deviation calculates the average return for periods with positive return and then measures the variation of those returns from the gain mean. The numeric value of this data point represents the volatility of the upside performance.

Gain Std Dev

A measure of the deviation of positive returns. A measure of the deviation of positive returns, which uses investment minus benchmark to determine "gain" periods.

Gain/Loss Ratio

The ratio between simple average gain and loss, multiplied by the ratio between the number of months with gain and number of months with loss.

It is calculated as follows:

$$Gain/Loss\ Ratio = ABS$$

where

ABS = Average Gain in Gain Period ÷ Average Loss in Loss Period

Information Ratio (arith)

An arithmetic measure of risk-adjusted performance. The Information Ratio is a special version of the Sharpe Ratio, but unlike the Sharpe Ratio, the benchmark doesn't have to be the risk-free return. In the Information Ratio, the default benchmark is the benchmark set in User Preferences.

Information Ratio (geo)

A geometric measure of risk-adjusted performance. The Information Ratio is a special version of the Sharpe Ratio, but unlike the Sharpe Ratio, the benchmark doesn't have to be the risk-free return. In the Information Ratio, the default benchmark is the benchmark set in User Preferences.

Jarque-Bera

In statistics, the Jarque-Bera (JB) test is a goodness-of-fit measure of departure from normality, based on the sample kurtosis and skewness. The statistic JB has an asymptotic chi-square distribution with two degrees of freedom and can be used to test the null hypothesis that the data are from a normal distribution. The null hypothesis is a joint hypothesis of both the skewness and kurtosis being 0, since samples from a normal distribution have an expected skewness of 0 and an expected excess kurtosis of 0. As the definition of JB shows, any deviation from this increases the JB statistic.

The test statistic JB is defined as:

$$JB = \frac{n}{6}\left(S_2 + \frac{(K-3^2)}{4}\right.$$

where,

n = the number of observations (or degrees of freedom in general)

S = is the sample skewness

K = is the sample kurtosis, defined as

$$S = \frac{\hat{\mu}_3}{\hat{\sigma}^3} \quad K = \frac{\hat{\mu}_4}{\hat{\sigma}^4}$$

$\mu 3$ and $\mu 4$ are the third and fourth central moments, respectively.

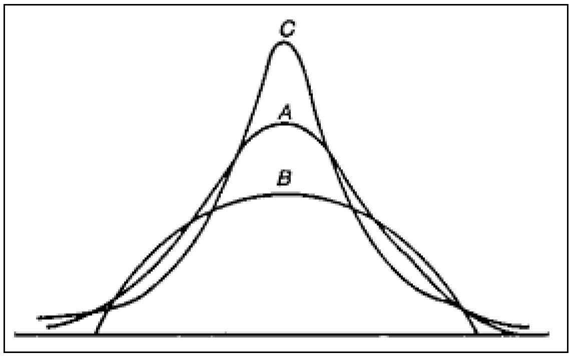
Kappa(3)

A generalized downside risk-adjusted performance measure. Used in regression analysis, Kappa represents the ratio of the dollar price change in the price of an option to a 1% change in the expected price volatility. A single parameter of Kappa determines whether the Sortino Ratio, Omega, or another downside risk-adjusted return measure is generated. See Sortino Ratio on page 24.

Kurtosis

Indicates tail behavior to the side of each peak. For normal distribution, Kurtosis is 3. Higher kurtosis indicates that more of the variance is due to infrequent extreme deviations (fat tails), as opposed to frequent, modestly sized deviations (low kurtosis and thin tails).

In a diagram showing kurtosis, a higher peak generally means fatter tails as well. In this diagram you can see that C has the highest kurtosis, not because it has the highest peak, but because it has the most probability in the tails. (Its line is above a and b at the tail ends.)



Last Date

The last date in the selected source data between the start and end date where data is available.

Last Value

The last value in the selected source data between the start and end date.

Longest Down-Streak# of Periods

Longest series of negative monthly returns.

In a case in which there are five negative periods, six negative periods, and seven negative periods, the value of the Longest Down-Streak # of Periods data point would be 7.

Longest Down-Streak End Date

The date on which the longest down-streak return period ended.

Longest Down-Streak Return

The cumulative return for the longest series of negative monthly returns.

Longest Down-Streak Start Date

The date on which the longest down-streak return period began.

Longest Up-Streak # of Periods

The longest series of positive monthly returns.

Longest Up-Streak End Date

The date on which the longest up-streak return period ended.

Longest Up-Streak Return

The cumulative return for the longest series of positive monthly returns.

Longest Up-Streak Start Date

The date on which the longest up-streak return period began.

Loss Deviation

A measure of the deviation of the investment's negative returns. It is calculated by finding the square root of the average of the squared negative returns.

Loss Std Dev

A measure of the deviation of negative returns, which uses investment minus benchmark to determine "loss" periods.

M-Squared

Developed by Modigliani and Modigliani (1997), M-Squared is a measure of the risk-adjusted returns of a portfolio, adjusted to match the risk of the market portfolio. It is derived from the widely used Sharpe ratio (see Sharpe Ratio on page 20), but it has the significant advantage of being shown in units of percent return, which makes it more intuitive to interpret.

Max

The highest value in the source data, which can be any data point in the Morningstar database.

Max Absolute Deviation

The absolute value of the largest deviation of the investment's return from the benchmark over a time period. By definition, "absolute" does not take into account negative or positive numbers. Each value is shown according to how far away it is from a specified number, such as 0.

Max Drawdown

A portfolio's maximum loss in a peak-to-trough decline before a new peak is attained. It is usually quoted as the percentage between the peak and the trough. It is an indicator of downside risk over a specified time period. Maximum Drawdown is computed as follows:

$$M = \frac{T - P}{P}$$

where:

M = maximum drawdown

T = trough value

P = peak value

For example, if a portfolio has an initial value of $500,000 that increases to $750,000 over a period of time, before dropping to $400,000. It then rebounds to $600,000, before dropping again to $350,000. Subsequently, it more than doubles to $800,000.

The maximum drawdown in this case is as follows:

$$\frac{350000 - 750000}{750000} = 53.33$$

Max Drawdown # of Periods

The number of months in a peak-to-trough decline that encompass the maximum drawdown for an investment.

Max Drawdown Peak Date

The date at which the maximum drawdown began.

Max Drawdown Recovery # of Periods

The number of periods of the trough-to-peak incline during a specific period of an investment or fund.

Max Drawdown Recovery Date

The end-of-month recovery date of a trough-to-peak decline during a specific time period.

Max Drawdown Valley Date

The date at which the max drawdown ended.

Max Gain

A portfolio's maximum gain in a trough-to-peak incline before a new trough is attained. It is usually quoted as the percentage between the trough and the peak. It is an indicator of upside risk over a specified time period. Maximum Gain is computed as follows:

$$M = \frac{P - T}{T}$$

where:

M = maximum gain

T = trough value

P = peak value

Max Gain # of Periods

The number of periods of the trough-to-peak incline during a specific recorded time period of an investment or fund.

Max Gain End Date

The end date of the trough-to-peak incline.

Max Gain Start Date

The start date of the trough-to-peak incline.

Median

The number in the middle of a set of numbers; that is, half the numbers have values that are greater than the median, and half have values that are less.

Min

The lowest value in the source data, which can be any data point in the Morningstar database.

Morningstar Return

A proprietary Morningstar calculation that represents the annualized measure of a fund's load-adjusted excess return, relative to the return of the 90-day Treasury Bill over a three-, five-, or ten-year period. This is a component of the Morningstar Risk-Adjusted Return. The Morningstar Return is displayed in decimal format and is calculated only for those investments with at least three years of performance history.

Morningstar Risk

A proprietary Morningstar calculation that represents the annualized measure of a fund's downside volatility over a three-, five-, or ten-year period. This is a component of the Morningstar Risk-Adjusted Return. The Morningstar Risk is displayed in decimal format and is calculated only for those investments with at least three years of performance history. A high number indicates higher risk and low numbers indicate lower risk.

Morningstar Risk-Adj Ret

The guaranteed return providing the same level of utility to an investor as the specific combination of returns exhibited by the fund. In other words, to "risk-adjust" the returns of two funds means to equalize their risk levels through leverage or deleverage before comparing them. The end result is an accurate representation of an investment's return that accounts for its level of risk. In a simplified manner, Morningstar Risk-Adjusted Return (MRAR) equals the investment's Morningstar Return minus its Morningstar Risk. Morningstar's level of risk is calculated differently than many other methods.

For example, Modern Portfolio Theory uses standard deviation as a unit of risk. Morningstar Risk, however, gives more weight to downside variation and does not make any assumptions about the distribution of excess returns. Morningstar Return uses historical excess returns as the basis for expected excess returns, rather than relying on analysts' forecasts or other probabilities of future returns. For funds, the MRAR is the return used for calculating the Morningstar Rating. Morningstar compares each investment's MRAR against other investments in its category to calculate a star rating.

Number of Observations

The number of observations (non-blank data) for the selected source data. It defaults to the monthly return.

Omega

Can be used as an alternative to the Sharpe Ratio in measuring risk-adjusted return. Omega is defined by Shadwick and Keating [2002], and unlike an investment's Sharpe, Omega doesn't assume a normal return distribution. It focuses on the likelihood of not meeting a target return. By design, Omega and Sortino Ratio measures are special cases of the Kappa measure.

Organic Growth Rate

The growth rate of a company from increasing output and sales, excluding profit from takeovers, acquisitions, or mergers.

Overall Capture Ratio

The ratio between up capture ratio and down capture ratio. (See Up Capture Ratio on page 29 and Down Capture Ratio on page 7.) An Overall Capture Ratio greater than 100% means the investment went up more than the market (benchmark) when the market had positive returns than the investment went down when the market had negative returns.

For example, if the up capture ratio is 130%, and the down capture ratio is 125%, the overall capture ratio is 104%.

Overall Deviation

The composite deviation of several standard deviations.

R2

The percentage of a portfolio's movements that can be explained by movement in its benchmark.

R2 (non-excess return)

The percentage of a portfolio's movements that can be explained by movement in its benchmark, based on non-excess return.

Relative Return (%)

A measure of showing how an investment performed in comparison with the benchmark by showing the percentage of the benchmark the investment met. For example, the benchmark had a return of 10% and the fund had a return of 12%. Therefore, the fund performed 120% of the benchmark.

$$\text{Relative Return (\%)} = 100 \times \frac{\text{Return of the investment}}{\text{Return of benchmark}}$$

Relative Risk

The ratio of the investment's standard deviation over the benchmark standard deviation.

Residual Std Dev

A statistical term used to describe the standard deviation of points formed around a linear function. It's an estimate of the accuracy of the dependent variable being measured. Residual standard deviation is also referred to as the standard deviation of points around a fitted line.

Residual Std Dev (non-excess return)

A statistical term used to describe the standard deviation of points formed around a linear function, based on non-excess return. It's an estimate of the accuracy of the dependent variable being measured. Residual standard deviation is also referred to as the standard deviation of points around a fitted line.

Return

Expressed as a percentage, Morningstar's calculation of total return for a fund is determined each month by taking the change in monthly net asset value, reinvesting all income and capital-gains distributions during that month, and dividing by the starting NAV. Reinvestments are made using the actual reinvestment NAV, and daily payoffs are reinvested monthly. Unless otherwise noted, Morningstar does not adjust total returns for sales charges (such as front-end loads, deferred loads, and redemption fees), preferring to give a clearer picture of a fund's performance. The total returns do account for management, administrative, 12b-1 fees, and other costs taken out of fund assets. Total returns for periods longer than one year are expressed in terms of compounded average annual returns (also known as geometric total returns). This presents a more meaningful picture of fund performance than non-annualized figures.

For stocks, only the market return can be calculated (since no NAV exists), but the market return is also stored as the total return. This allows users to more easily compare a stock's return to that of other investments.

For standard time periods (one, three, five, and ten years), returns are annualized as follows:

$$\text{Ann Ret} = (1 + \text{Cum Ret})^{\frac{1}{y}} - 1$$

where,

Cum Ret = the cumulative return

y = the number of years (1,3, 5 or 10)

For customized time periods, returns are annualized as follows:

$$\text{Ann Ret} = (1 + \text{Cum Ret})^{\frac{365.25}{d}} - 1$$

where,

Cum Ret = the cumulative return

d = the number of days between the start and end dates

Return (Calendar Weekly)

The calendar weekly returns based on the Daily Return Index (see Return (Day to Day) on page 17) and display a 7–day moving window size with a 7–day moving step.

Return (Day to Day)

The daily account balance experienced by an investor who purchased one share on inception date. The numbers reflect any uninvested cash accrued to the account (such as future distributions and daily dividends). For non-price days (weekends and holidays), Morningstar stores the last business day's balance. There are some funds that have weekend and holiday daily dividends so the balance can change on those days.

Return Offer-Bid (Day to Day)

A calculation of performance, return, or cost that includes the bid-offer involved in buying and then reselling the investment. The Daily Offer Price Index is the lowest price at which a market maker will sell a specified number of shares of a mutual fund at any given time. This is calculated on a day-to-day basis.

Semi Dev

A measure of dispersion for a data set's values that follow below the observed mean or target value. Semi deviation is the square root of semi-variance, which is calculated by averaging the deviations of observed values that have a result that is less than the mean. The formula for semi deviation is as follows:

$$S = \sqrt{\frac{1}{n}\left(\sum_{r < Average}^{n} (Average - r)^2\right)}$$

Where:

S = semi deviation

n = the total number of observations below the mean

r = the observed value

average = the mean or target value of a data set

In portfolio theory, semi deviation provides an effective measure of downside risk for a portfolio. It is similar to standard deviation, but it looks at only those periods where the portfolio's return was less than the return of the target or average level. This allows investors to see how much loss can be expected from a portfolio, instead of looking at its expected fluctuations.

Semi Std Dev

Measure of downside risk that evaluations only those monthly returns that fall below a minimum threshold. Semi standard deviation can be tailored to the specific objectives and risk profile of different investors with various levels of minimum acceptable return.

Standard deviation, the most widely used measure of investment risk, has some limitations, such as the fact that it treats all deviations from the average the same—whether positive or negative. However, investors are generally more concerned with negative divergences than positive ones, i.e. downside risk. Downside deviation resolves this issue by focusing only on downside risk.

Semi Variance

A measure of the dispersion of a data set’s observations that fall below the mean or target value. Semi variance is an average of the squared deviations of values that are less than the mean.

By ignoring all values above the mean or an investor's target return, semi variance estimates the average loss that a portfolio could incur. For risk adverse investors, solving for optimal portfolio allocations by minimizing semi variance would limit the likelihood of a large loss.

Semi variance is calculated as follows:

$$S = \frac{1}{n} \cdot \sum_{r_t < A}^{n} (A - r_t)^2$$

where

A = the mean or target value of the data set

n = total number of observations below the mean

r_t the observed value

Sharpe Ratio

A risk-adjusted measure developed by Nobel Laureate William Sharpe that calculates the mean of a fund's returns over the that of the risk-free rate. The higher the Sharpe Ratio, the better a fund's historical risk-adjusted performance.

Two funds with a similar return can be compared using the Sharpe Ratio because it discounts the amount of risk each fund had to take in order to earn the return it did.

The Sharpe Ratio is calculated for a period by dividing a fund's excess return over the risk-free rate by the standard deviation of the excess return over the risk-free rate.

> ☞ Note: The excess returns are those of the risk-free rate, and not a benchmark.

The Sharpe Ratio is calculated as follows:

$$\text{Sharpe Ratio} = \frac{\left(\frac{\sum_{i=1}^{n} R_i}{n}\right) - \left(\frac{\sum_{i=1}^{n} RF_i}{n}\right)}{StDev}$$

where

$$StDev = \sqrt{\frac{1}{n-1} \bullet \sum_{i=1}^{n} (R_i - \bar{R})^2}$$

and

$StDev$ = standard deviation for the month

R_i = return of the investment in time period i

RF_i = return of the risk-free investment in time period i

m = number of time periods in a year

n = total number of time periods

$\bar{R}$ = Average return of the investment over the time period

Sharpe Ratio (arith)

An arithmetic risk-adjusted measure developed by Nobel Laureate William Sharpe that calculates the arithmetic mean of a fund's returns over the that of the risk-free rate. It is used to determine reward per unit of risk. The higher the Sharpe Ratio (arith), the better the fund's historical risk-adjusted performance.

Since this ratio uses standard deviation as its risk measure, it is most appropriately applied when analyzing a fund that is an investor's sole holding. The Sharpe Ratio (arith) can directly compare two funds, analyzing how much risk a fund had to bear to earn excess return over the risk-free rate.

The Sharpe Ratio (arithmetic) is calculated for a period by dividing a fund's annualized excess return over the risk-free rate by the standard deviation of the excess return over the risk-free rate.

☞ Note: In Sharpe Ratio (arith), the returns for the period are compounded and then annualized.

The Sharpe Ratio (arith) (SharpeRatio_A) is calculated as follows:

$$\text{Sharpe Ratio}_A = \frac{\left[\prod_{i=1}^{n}(1+R_i)\right]^{\frac{m}{n}} - \left[\prod_{i=1}^{n}(1+RF_i)\right]^{\frac{m}{n}}}{StDev_A}$$

where

$$StDev_A = \sqrt{\frac{1}{n-1} \bullet \sum_{i=1}^{n}(R_i - \bar{R})^2}$$

and

$StDev_A$ = annualized arithmetic standard deviation

R_i = return of the investment in time period i

RF_i = return of the risk-free investment in time period i

m = number of time periods in a year

n = total number of time periods

$\bar{R}$ = Average return of the investment over the time period

Sharpe Ratio (geo)

A geometric risk-adjusted measure developed by Nobel Laureate William Sharpe that calculates the geometric mean of a fund's returns over the that of the risk-free rate. It is used to determine reward per unit of risk. The higher the Sharpe Ratio (geo), the better the fund's historical risk-adjusted performance.

Since this ratio uses standard deviation as its risk measure, it is most appropriately applied when analyzing a fund that is an investor's sole holding. The Sharpe Ratio (geo) can directly compare two funds, analyzing how much risk a fund had to bear to earn excess return over the risk-free rate.

☞ Note: In Sharpe Ratio (geo), the returns for the period are compounded and then annualized.

The Sharpe Ratio (geo) (SharpeRatio_G) is calculated as follows:

$$\text{Sharpe Ratio}_G = \frac{\left[\prod_{i=1}^{n}(1+R_i)\right]^{\frac{m}{n}} \Big/ \left[\prod_{i=1}^{n}(1+RF_i)\right]^{\frac{m}{n}} - 1}{StDev_G}$$

where

$$StDev_G = \sqrt{\frac{1}{n-1} \bullet \sum_{i=1}^{n}(R_i - \bar{R})^2}$$

and

$StDev_G$ = Annualized Geometric Standard Deviation

R_i = Return of the investment in time period i

RF_i = Return of the risk-free investment in time period i

m = Number of time periods in a year

n = Total number of time periods

$\bar{R}$ = Average return of the investment over the time period

Size Consistency (Long)

Size Consistency is derived directly from the Size Consistency Metric as follows:

- HIGH: Size Consistency Metric is less than 6.
- MEDIUM: Size Consistency Metric is between 6 and 21.
- LOW: Size Consistency Metric is greater than 21.

The breakpoints of 6 and 21 are static following a 20-60-20 rule. That is, roughly 60% of portfolios will be labeled as Medium, and 20% each as Low and High.

Size Consistency Metric (Long)

The Size Consistency Metric measures the extent of historical portfolio/strategy movement in the size (Y axis) dimension. Investments with low scores are considered more consistent and assigned a style consistency designation of "HIGH," while investments with high scores are considered less consistent and assigned a style consistency designation of "LOW." The metric is calculated by taking the standard deviation of the Size Scores of all available portfolios from the past three years. When the number of eligible portfolios is fewer than six, no calculation will be made.

Size Dispersion (Long)

Size Dispersion is derived directly from the Size Dispersion Metric as follows.:

- LOW: Size Dispersion Metric is less than 43.
- MEDIUM: Size Dispersion Metric is between 43 and 86.
- HIGH: Size Dispersion Metric is greater than 86.

The breakpoints of 43 and 86 are static following a 20-60-20 rule. That is, roughly 60% of portfolios will be labeled as Medium, and 20% each as Low and High.

Size Dispersion Metric (Long)

The Size Dispersion Metric measures the variance among the holdings in the most recent portfolio in terms of size orientation. The metric is calculated by taking the weighted variance of the Size Scores of the stocks in the portfolio.

Size Score (Long)

Rather than a fixed number of large cap or small cap stocks, Morningstar uses a flexible system that isn't adversely affected by overall movements in the market. The Morningstar stock universe represents approximately 99% of the U.S. market for actively traded stocks. Giant-cap stocks are defined as the group that accounts for the top 40% of the capitalization of the Morningstar domestic stock universe; large-cap stocks represent the next 30%; mid-cap stocks represent the next 20%; small-cap stocks represent the next 7%; and micro-cap stocks represent the remaining 3%. Each stock is given a Size Score that ranges from –100 (very micro) to 400 (very giant). When classifying stocks to a Style Box, giant is included in large and micro is included in small.

Skewness

The degree of asymmetry from the normal distribution in a data set. If the distribution has a longer left tail, the function has negative skewness. A longer right tail indicates positive skewness. A normal distribution is symmetrical with a skewness of 0. In log normal case, the curve has a long right tail so the skewness is positive.

Sortino Ratio

Developed in early 1980's by Frank Sortino, the Sortino Ratio is similar to the Sharpe Ratio (see Sharpe Ratio on page 20) but unlike the Sharpe Ratio, the Sortino Ratio differentiates harmful volatility from total overall volatility by using downside risk (see Downside Deviation on page 8).

The Sortino ratio is a useful way for investors, analysts, and portfolio managers to evaluate an investment's return for a given level of bad risk. Since this ratio uses the downside deviation as its risk measure, it addresses the problem of using total risk, or standard deviation, as upside volatility is beneficial to investors.

Like the Sharpe ratio, a higher Sortino ratio is better. When looking at two similar investments, the one with the higher Sortino ratio is earning more return per unit of bad risk.

The formula for the Sortino ratio is as follows:

$$S = \frac{\langle R \rangle - R_f}{\sigma_s}$$

where

S = Sortino Ratio

$\langle R \rangle$ = Expected return

R_f = Risk-free rate of return

σ_d = Downside deviation

Sortino Ratio (arith)

Similar to the Sharpe Ratio (arith) but unlike the Sharpe Ratio (arith), the Sortino Ratio (arith) uses downside risk (Downside Deviation) in the denominator. It was developed in early 1980's by Frank Sortino. Since upside variability is not necessarily a bad thing,

The Sortino Ratio (arith) is calculated for a period by dividing a fund's annualized excess return over the risk-free rate by the downside deviation of the excess return over the risk-free rate.

The formula for the Sortino ratio (arith) is as follows:

$$S_a = \frac{\langle R \rangle - R_f}{\sigma_a}$$

where

S_a = Sortino Ratio (arith)

$\langle R \rangle$ = Expected return

R_f = Risk-free rate of return

σ_a = Downside deviation (arith)

Sortino Ratio (geo)

Similar to the Sharpe Ratio (geo) but unlike the Sharpe Ratio (geo), the Sortino Ratio (geo) uses downside risk (Downside Deviation) in the denominator. It was developed in early 1980's by Frank Sortino. Since upside variability is not necessarily a bad thing, Sortino Ratio (geo) is sometimes preferable to the Sharpe Ratio (geo).

The Sortino Ratio (geo) is calculated for a period by dividing a fund's annualized excess return over the risk-free rate by the downside deviation of the excess return over the risk-free rate.

The formula for the Sortino ratio (geo) is as follows:

$$S_g = \frac{\langle R \rangle - R}{\sigma_g}$$

where

S_g = Sortino Ratio (geo)

<R> = Expected return

R_f = Risk-free rate of return

σ_g = Downside deviation (geo)

Std Dev

The statistical measurement of dispersion of returns of a set of sample stocks or funds about an average. It depicts how widely the returns varied over a certain period of time. Investors use the standard deviation of historical performance to predict the range of returns that are most likely for a given fund. When a fund has a high standard deviation, the predicted range of performance is wide, implying greater volatility. Standard deviation should be calculated for one investment at a time, rather than a portfolio of funds at once. The figure cannot be combined for more than one fund because the standard deviation for a portfolio of multiple funds is a function of not only the individual standard deviations, but also of the degree of correlation among the funds' returns.

If a fund's returns follow a normal distribution, approximately 68 percent of the time they will fall within one standard deviation of the mean return for the fund, and 95 percent of the time within two standard deviations. Morningstar computes standard deviation using the trailing monthly total returns for the appropriate time period. All of the monthly standard deviations are then annualized.

The standard deviation is calculated as follows:

$$s = \sqrt{\frac{\sum (X - \bar{X})^2}{n - 1}}$$

where

s = sample standard deviation

X = return of the investment

$\bar{X}$ = sample mean

n = number of scores in sample

Std Dev Population

The statistical measurement of dispersion of returns of a specific set (the population) of stocks or funds about an average. It depicts how widely the returns varied over a certain period of time. It is calculated as follows:

$$\sigma_P = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (R_i - \bar{R})^2}$$

where

σ_P = monthly standard deviation

n = number of periods

R_i = return of the investment in month i

$\bar{R}$ = average monthly total return for the investment

Std Error Alpha

The standard error of the Alpha (i.e., using the sample Alpha as a method of estimating the population Alpha) measures the accuracy with which a sample represents a population.

The standard error is inversely proportional to the sample size; the larger the sample size, the smaller the standard error, because the statistic will approach the actual value.

Std Error Alpha (non-excess return)

The standard error of the Alpha (non-excess return) (i.e., using the sample Alpha (non-excess return) measures the accuracy with which a sample represents a population.

The standard error is inversely proportional to the sample size; the larger the sample size, the smaller the standard error, because the statistic will approach the actual value.

Std Error Beta

The standard error of the Beta (i.e., using the sample Alpha as a method of estimating the population Beta) measures the accuracy with which a sample represents a population.

The standard error is inversely proportional to the sample size; the larger the sample size, the smaller the standard error, because the statistic will approach the actual value.

Std Error Beta (non-excess return)

The standard error of the Beta (non-excess return) (i.e., using the sample Beta (non-excess return) as a method of estimating the population Beta (non-excess return)) is the standard deviation of those sample Betas over all possible samples (of a given size) drawn from the population.

Sterling Ratio

Used mainly in the context of hedge funds, this risk-reward measure determines which hedge funds have the highest returns while enduring the least amount of volatility. The formula is as follows:

$$\text{Sterling Ratio} = \frac{\text{Compounded Annual Return}}{\text{Average Maximum Drawdown} - 10\%}$$

This formula uses the average for risk (drawdown) and return over the past three years. Drawdown is calculated at the maximum potential loss in the given year.

Style Consistency (Long)

Style Consistency is derived directly from the Style Consistency Metric as follows.:

- HIGH: Style Consistency Metric is less than 9.
- MEDIUM: Style Consistency Metric is between 9 and 29.
- LOW: Style Consistency Metric is greater than 29.

The breakpoints of 9 and 29 are static following a 20-60-20 rule. That is, roughly 60% of portfolios will be labeled as Medium, and 20% each as Low and High.

Style Dispersion (Long)

Style Dispersion is derived directly from the Style Dispersion Metric as follows:

- LOW: Style Dispersion Metric is less than or equal to 100.
- MEDIUM: Style Dispersion Metric is between 100 and 148.
- HIGH: Style Dispersion Metric is equal to or greater than 148.

The breakpoints of 100 and 148 are static following a 20-60-20 rule. That is, roughly 60% of portfolios will be labeled as Medium, and 20% each as Low and High.

Style Dispersion Metric (Long)

The Style Dispersion Metric measures the degree of overall scatter of the holdings in the most recent portfolio along both the value-growth and size dimensions. The metric is calculated from the Value-Growth Dispersion Metric and Size Dispersion Metric according to the Pythagorean theorem:

SQRT(Value-Growth Dispersion Metric+Size Dispersion Metric)

Sum

The sum of the source data, which can be any piece of data in the Morningstar database.

Tracking Error

A measure of the volatility of excess returns relative to a benchmark**.**

It is often in the context of a hedge or mutual fund that did not work as effectively as intended, creating an unexpected profit or loss instead.

Given a sequence of returns for an investment or portfolio and its benchmark, tracking error is calculated as follows:

Tracking Error = Standard Deviation of (P–B)

where

P = the return of the investment

B = the return of the benchmark

For example, assume that there is a large cap mutual fund that is benchmarked to the Standard and Poor's 500 index. Next, assume that the mutual fund and the index realized the follow returns over a given five-year period:

Mutual Fund: 11%, 3%, 12%, 14% and 8%.

S&P 500 index: 12%, 5%, 13%, 9% and 7%.

Given this data, the series of differences is then (11% - 12%), (3% - 5%), (12% - 13%), (14% - 9%) and (8% - 7%). These differences equal -1%, -2%, -1%, 5%, and 1%. The standard deviation of this series of differences, the tracking error, is 2.79%.

If you make the assumption that the sequence of return differences is normally distributed, you can interpret tracking error in a very meaningful way. In the above example, it can be expected that the mutual fund will return within 2.79%, plus or minus, of its benchmark approximately every two years out of three.

From an investor point of view, tracking error can be used to evaluate portfolio managers. If a manager is realizing low average returns and has a large tracking error, it is a sign that there is something significantly wrong with that investment and that the investor should most likely find a replacement.

Treynor Ratio (arith)

Similar to the Sharpe Ratio (arith), the Treynor Ratio (arith) is a measurement of efficiency utilizing the relationship between annualized risk-adjusted return and risk. Unlike Sharpe Ratio (arith), Treynor Ratio (arith) utilizes "market" risk (Beta) instead of total risk (Std Dev). Good performance efficiency is indicated by a high ratio.

Treynor Ratio (geo)

Similar to the Sharpe Ratio (geo), the Treynor Ratio (geo) is a measurement of efficiency utilizing the relationship between annualized risk-adjusted return and risk. Unlike Sharpe Ratio (geo), Treynor Ratio (geo) utilizes "market" risk (Beta) instead of total risk (Std Dev). Good performance efficiency is indicated by a high ratio.

Up Capture Ratio

A measure of a manager's performance in markets with returns at or above 0% relative to the market (benchmark). It is calculated by taking the security's upside capture return and dividing it by the benchmark's upside capture return.

Up Capture Return

Up Capture Return is a measure of the manager's performance in periods when the market (benchmark) goes up. This is shown as a percentage value.

Up Number

The number of months in a given time period where an investment's performance was above 0%.

Up Number Ratio

A measure of the number of periods that the investment was up when the benchmark was up, divided by the number of periods that the benchmark was up. The larger the ratio, the better.

Suppose a fund's benchmark has a return above 0% for nine months of a three-year period and that the fund has a return of greater than 0% for twelve months, six of which are in common with the benchmark. The up number ratio is 6 / 9 = 66.7%

Up Percent Ratio

A measure of the number of periods that the investment outperformed the benchmark when the benchmark was up, divided by the number of periods that the benchmark was up. The larger the ratio, the better.

A measure of the number of periods that the investment outperformed the benchmark when the benchmark was above 0% for a given time period, divided by the number of periods that the benchmark was above 0%. The larger the ratio, the better

For example, imagine a benchmark that in a three-year period had a return above 0% for six months, and during these up months, a fund outperformed the benchmark three times. The Up Percent Ratio for the fund would be 0.50.

Up Period Percent

Number of months an investment's returns were at or above 0%, divided by the total number of months.

Upside Deviation

Measures only deviations above a specified benchmark. This can be calculated as an annualized and un-annualized figure. The equations for each are below.

Unannualized:

$$\sigma_{ud} = \sqrt{\frac{\sum_{i=1}^{T} y_{ud,t}{}^2}{T}}$$

where,

$$y_{ud,t} = \min(0, R_t - B_t)$$

R_t = return of the investment product in period t

B_t = return of the benchmark in period t

T = total number of periods

Annualized:

$$\sigma_{ud,A} = \sigma_{ud} \bullet \sqrt{n}$$

where,

n = number of periods in a year, e.g., 12 when using monthly data

Upside Std Dev

A measurement of dispersion about an average, expressing how widely the returns of an investment vary over a certain period of time and how close to the mean they are. Standard deviation is used as a risk measure: low values of standard deviation suggest the investment has low volatility, meaning the returns are very close to the mean. High values of standard deviation suggest the investment has high volatility and that returns are more distant from the mean. Standard deviation is used when examining investments on a standalone basis. When analyzing volatility from a portfolio perspective, the correlation among investments must also be taken into account. Morningstar computes standard deviation using the trailing monthly total returns for the appropriate time period. All of the monthly standard deviations are then annualized.

Value at Risk

The potential loss in value of a traded portfolio over a defined period for a given confidence level.

Example: If a bank has a $100 million traded portfolio and has a daily VaR of 3% for a 99% confidence interval, it means that there is a 1% chance they could lose 3% or more of their portfolio over a daily basis.

Methods:

- Historical: This method uses the historical return distribution and measure the exact percentile of VaR requested.
- Log Normal: This method uses the historical mean and standard deviation to fit a log-normal distribution, which is then used to calculate the VaR requested.
- Log-Stable: This method uses the historical data to fit to a log-stable distribution, which is then used to calculate the VaR requested.

Settings:

- Time Range: The time period to be used for the calculation
- Fit: The distribution to be used
- Frequency: The frequency of data to be used
- Scaling: Whether a value or percentage is used for the VaR calculation
- Confidence Level: The cutoff value for VaR

Value at Risk (Log-Stable)

The potential loss in value of a traded portfolio over a defined period for a given confidence level.

Example: If a bank has a $100 million traded portfolio and has a daily VaR of 3% for a 99% confidence interval, it means that there is a 1% chance they could lose 3% OR MORE of their portfolio over a daily basis.

Methods:

- Historical: This method will use the historical return distribution and measure the exact percentile of VaR requested.
- Log Normal: This method uses the historical mean and standard deviation to fit a log-normal distribution, which is then used to calculate the VaR requested.
- Log-Stable: This method uses the historical data to fit to a log-stable distribution, which is then used to calculate the VaR requested.

Settings:

- Time Range: The time period to be used for the calculation
- Fit: The distribution to be used
- Frequency: The frequency of data to be used
- Scaling: Whether a value or percentage is used for the VaR calculation
- Confidence Level: The cutoff value for VaR

Value Growth Consistency (Long)

Value-Growth Consistency is derived directly from the Value-Growth Consistency Metric as follows:

- HIGH: Size Consistency Metric is less than X.
- MEDIUM: Size Consistency Metric is between X and X.
- LOW: Size Consistency Metric is greater than X.

The breakpoints of X and XX are static following a 20-60-20 rule. That is, roughly 60% of portfolios will be labeled as Medium, and 20% each as Low and High.

Value Growth Consistency Metric (Long)

The Value Growth Consistency Metric measures the extent of historical portfolio/strategy movement in the value-growth (X axis) dimension. Investments with low scores are considered more consistent, while investments with high scores are considered less consistent. The metric is calculated by taking the standard deviation of the Value-Growth Scores of all available portfolios from the past three years. When the number of eligible portfolios is fewer than six, no calculation will be made.

Value-Growth Score (Long)

The scores for a stock's value and growth characteristics determine its horizontal placement. There are five value factors and five growth factors.

Value Factors:

Forward Looking: Price/Projected Earnings 50.0%

Historical-Based Measures:

- Price/Book 12.5%
- Price/Sales 12.5%
- Price/Cash Flow 12.5%
- Dividend Yield 12.5%

Growth Factors:

Forward Looking: Long-term Projected Earnings Growth 50.0%

Historical-Based Measures:

- Book Value Growth 12.5%
- Sales Growth 12.5%
- Cash Flow Growth 12.5%
- Historical Earnings Growth 12.5%

Worst Month

The lowest monthly return of the investment since its inception, or for as long as Morningstar has data available.

Worst Month End Date

The end date of the lowest monthly return of the investment since its inception, or for as long as Morningstar has data available.

Worst Quarter

The lowest quarterly (3 month) return of the investment since its inception, or for as long as Morningstar has data available.