Financial Mathematics

The Sortino Ratio

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The Sortino Ratio

- The Sortino Ratio measures the risk-adjusted return of an investment asset, portfolio or strategy.
- The Sortino Ratio is a modification of the Sharpe ratio but penalizes only those returns falling below a user-specified target, or required rate of return, while the Sharpe ratio penalizes both upside and downside volatility equally.

The Sortino Ratio

- Though both ratios measure an investment's risk-adjusted returns, they do so in significantly different ways that will frequently lead to differing conclusions as to the true nature of the investment's return-generating efficiency.

The Sortino Ratio

The Sortino ratio is calculated as:

$$S = \frac{R - T}{DR},$$

where

- R is the asset or portfolio average realized return,
- T is the target or required rate of return for the investment strategy under consideration, *(T was originally known as the minimum acceptable return, or MAR).*
- DR is the **Target Semi-deviation**.

The Sortino Ratio

The Target Semi-deviation is given by

$$DR = \sqrt{\left(\frac{1}{N} \sum_{k=1}^{N} (r_k - T)^2 f(r_k) \right)},$$

where

- T is a target rate of return
- r_k is the k^{th} return
- $f(r_k) = 1$ if $r_k < T$
  $f(r_k) = 0$ if $r_k > T$