WHITE PAPER

Risk Measures and Exposure

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Risk Measures and Exposure

Introduction

The risk measures report shows the current risk of a portfolio using several industry standard valuation measures. Risk measures are only applicable to the Time-Weighted Return (TWR) performance measure.

Alpha Ratio

A ratio that measures excess return compared to a benchmark.

Calculate Alpha Ratio

(Annualized Portfolio Return - Risk-Free Rate of Return) - (Beta (Annualized Benchmark Return - Risk-Free Rate of Return))

Alpha Ratio Example

Date	Portfolio Return	Risk-Free Rate of Return	Benchmark Return
June 2021	3.74%	0.03%	2.74%
June 2020	2.71%	0.17%	1.37%
June 2019	2.29%	2.28%	1.19%
Average	**2.91%**	**0.8267%**	**1.77%**
Annualized	**2.85%**		**1.65%**

Beta = 0.577361349
(2.85% - 0.8267%) – (0.577361349 (1.65% - 0.8267%))
Alpha = 1.55%

Beta Ratio

A ratio that measures the volatility or systematic risk of the portfolio in comparison to a benchmark.

Calculate Beta Ratio

Covariance (Portfolio Returns, Benchmark Returns) / Variance (Benchmark Returns)

Beta Ratio Example

Date	Portfolio Return	Benchmark Return
6/11/2021	0.48%	0.44%
6/10/2021	-1.54%	-1.37%
6/9/2021	1.99%	1.19%
6/8/2021	1.12%	0.89%

Covariance(Portfolio Returns, Benchmark Returns) = 0.000127
Variance(Benchmark Returns) = 0.000132
Beta = 0.000127 / 0.000132
Beta = 0.968214

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Calmar Ratio

A ratio used to determine return versus drawdown risk.

Calculate Calmar Ratio

Average Compound Annual Growth Rate / Maximum Drawdown

Calmar Ratio Example

Date	Compound Annual Growth Rate	Max Drawdown
June 2021	1.52%	0.72%
June 2020	-0.39%	-1.09%
June 2019	1.01%	1.11%
June 2018	2.12%	-0.94%
Average	**1.07%**	
Max Drawdown		**1.09%**

1.07 / 1.09 = 0.98%

Correlation

A statistical figure that measures the interdependence between the range of returns for a specified benchmark(s) and your portfolio. A positive correlation exemplifies a strong relationship whereas a negative correlation exemplifies a weak relationship.

Calculate Correlation

Covariance / Product of Standard Deviations

Where:	
A	List of deviations from the mean for each account return per day
B	List of deviations from the mean for each given benchmark return per day
Covariance	(SUMMATION (A~X~+ B~X~)) / (Number of Account Returns – 1)
Product of Standard Deviations	Account Standard Deviation X Given Benchmark Standard Deviation

Correlation Example

Date	Account Return	Benchmark Return	Account Deviation from Mean	Benchmark Deviation from Mean	Account Deviation from Mean Squared	Benchmark Deviation from Mean Squared
9/25/2017	-.008800	-0.002200	-0.009700	-0.003620	.000094	0.000013
9/26/2017	.000100	0.000100	-0.000800	-0.001320	0.000001	0.000002
9/27/2017	.008100	0.004100	-0.007200	0.002680	0.000052	0.000007
9/28/2017	.001100	0.001400	0.000200	-0.000020	0.000000	0.000000
9/29/2017	.004000	0.003700	0.003100	0.002280	0.000010	0.000005
Mean Return	**0.000900**	**0.001420**				
Sum of the Deviation from Mean Squared	**0.000156**	**0.000027**				
Variance	**0.000039**	**0.000007**				
Standard Deviation	**0.006249**	**0.002609**				

0.00001563 / 0.00001630 = 0.96

Distribution of Returns

The range of return percentage of each day, month, or quarter in the specified time period and the number of times the return performance fell within that range for the entire period.

Downside Deviation

The standard deviation for all negative returns in your portfolio in the specific time period.

Information Ratio

A ratio that calculates the risk-adjusted returns of a portfolio relative to a benchmark.

Calculate Information Ratio

(Portfolio Return - Benchmark Return) / Tracking Error

Information Ratio Example

Date	Portfolio Return	Benchmark Return	Difference
June 2021	2.14%	1.74%	0.40%
June 2020	1.98%	1.27%	0.71%
June 2019	0.74%	1.12%	-0.38%
Average	**1.62%**	**1.38%**	**0.24%**

Standard Deviation (Tracking Error) = 0.005616345
Information Ratio = (1.62% - 1.38%) / 0.005616345
Information Ratio = 0.433259219

Max Drawdown

The largest negative cumulative return from a peak to a trough before a new peak is attained, expressed as a percentage. Maximum drawdown is an indicator of downside risk over a specified period.

Calculate Max Drawdown

The largest negative cumulative return from a peak to a trough before a new peak is attained is calculated using VAMI (1000 × (1 + Return)).

[(Largest VAMI During Specified Period – Ending VAMI During Specified Period) / (Largest VAMI During Specified Period)]

Notes:

- The Max Drawdown is reflected as a positive percentage.

Max Drawdown Example

Sub Period	TWR	VAMI	Peak VAMI	Max VAMI Drawdown	Max Drawdown %
		1,000.00			
Jan 2023	8.29%	1,082.94	1,082.94	0.00	0.00%
Feb 2023	9.05%	1,180.89	1,180.89	0.00	0.00%
Mar 2023	-0.84%	1,170.92	1,180.89	9.97	0.84%
Apr 2023	10.99%	1,299.61	1,299.61	0.00	0.00%
May 2023	3.17%	1,340.83	1,340.83	0.00	0.00%
Jun 2023	-2.35%	1,309.39	1,340.83	31.45	2.35%
Jul 2023	-0.11%	1,307.91	1,340.83	32.92	2.46%
Aug 2023	0.59%	1,315.69	1,340.83	25.15	1.88%
Sep 2023	-4.77%	1,252.90	1,340.83	87.93	6.56%
Oct 2023	-4.56%	1,195.82	1,340.83	145.01	10.81%
Nov 2023	-6.01%	1,123.95	1,340.83	216.88	16.18%
Dec 2023	0.07%	1,124.69	1,340.83	216.14	16.12%

Mean Return

The average time weighted return of your portfolio for a specified time period.

Negative Periods

The number of occurrences of negative performance returns. For example, if you select a monthly report with 12 months, each month with a negative return would be a negative occurrence.

Peak-to-Valley

The period during which the max drawdown occurred. For example, if the start of the largest negative cumulative return was April 1st and the end was April 5th, the Peak-to-Valley would be 4/1 – 4/5.

Positive Periods

The number of occurrences of positive performance returns. For example, if you select a monthly report with 12 months, each month with a positive return would be a positive occurrence.

Recovery

The time it took for the NAV of your account to recover from the valley (lowest NAV) back to peak (highest NAV). For example, if the valley was on April 5th and your account NAV returned to peak on April 6th, the recovery would be 1 day.

Notes:

- If the account NAV has yet to recover back to peak, recovery will show ongoing in the Risk Analysis.

Sharpe Ratio

A ratio that measures the excess return per unit of risk. The ratio is used to characterize how well the return compensated the account holder for the risk taken.

Calculate Sharpe Ratio

$$\frac{Annualized\ Average\ Return - Annualized\ Average\ Risk\ Free\ Rate}{Annualized\ Standard\ Deviation}$$

Where:	
Annualized Account Return	$Average\ Portfolio\ Return \times n$
Annualized Standard Deviation	$Standard\ Deviation \times \sqrt{n}$
n	The annualization factor. Daily = 260 I Monthly = 12 I Quarterly = 4

Notes:

- The Risk-Free Rate is the US 3 Month Treasury Bill.
- Daily historical Risk-Free Rates are used when calculating the annualized average risk-free rate.

Sharpe Ratio Example

Using n = 260 and $Annualized\ Average\ Risk\text{-}Free\ Rate$ = 3.82:
If the $Average\ Portfolio\ Return$ = 0.111357, the $Annualized\ Average\ Return$ = 0.111356 × 260 = 28.95282.
If the $Standard\ Deviation$ = 0.726409, the $Annualized\ Standard\ Deviation$ = 0.726409 × $\sqrt{260}$ = 11.71299.

$$Sharpe\ Ratio = \frac{28.95282 - 3.82}{11.71299} = \mathbf{2.14572}$$

Sortino Ratio

The ratio measures the risk adjusted return of the account. The ratio penalizes only those returns that fall below the required rate of return.

Calculate Sortino Ratio

[(Annualized Excess Return / Annualized Downside Deviation)]

Notes:

- The historical annual return including dividends since inception of the S&P 500 is used to calculate the downside deviation and the Sortino Ratio.

Sortino Ratio Example

Date	Account Return	Risk-Free Rate	Excess Return
January 2018	6.50%	0.60%	5.90%
February 2018	1.56%	0.60%	0.96%
March 2018	-15.49%	0.60%	-16.09%
April 2018	31.57%	0.60%	30.97%
Average	**6.04%**	**0.60%**	**5.44%**
Annualized			**6.52%**

$[(6.52\% / (10.00\% \times \sqrt{12}))] = 0.19$

Notes:

- Downside deviation is the standard deviation of all negative returns within the specified time period. In the above example, the only negative account return was for March 2018.
- The number of values used in the given time period is less than the monthly period used to annualize excess return and downside deviation.

Standard Deviation

A statistical measurement of variability. It shows how much variation or dispersion there is from the average.

Calculate Standard Deviation

$$\sigma = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}}$$

Where:

σ	Standard deviation of a sample
Σ	Sum of
x	Each value in the data set
$\bar{x}$	Mean of all values in the data set
n	Number of values in the data set

Tracking Error

A statistical figure that represents the deviations from the difference between returns of the portfolio and returns of the benchmark.

Calculate Tracking Error

Standard Deviation × [(Portfolio Return Day 1 – Benchmark Return Day 1, (Portfolio Return Day 2 – Benchmark Return Day 2), etc.]

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Turnover

Percentage of holdings that have been replaced in a given year.

Calculate Turnover

The total value of new securities purchased, or the value of new securities sold (whichever is less) / monthly average of the market value of the portfolio securities during the report period.

Turnover Example

Date	Portfolio Return	Benchmark Return
June 2021	$1,540.43	$150
July 2021	$2,100.19	-$200
August 2021	$1,903.97	$100
Average	**$1,848.20**	**-**

Value of Securities Purchases = $200
Turnover = 200 / 1,848.20
Turnover = 10.82%

VAMI (Value-Added Monthly Index)

A statistical figure that tracks the daily, monthly, or quarterly performance of a hypothetical $1000 investment.

Calculate VAMI

1000 × [(1 + Return)] OR Previous VAMI × [(1 + Current Return)]

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Exposure

Exposure is key when considering long and short strategies to evaluate risk and leverage.

Long and Short Exposure

Long/short exposure only includes positions held and long/short parsed exposure includes components of funds held in the portfolio.

Type	Exposure	$	%
Long	Exposure	Total Long Value	Total Long Value / (Total Long Value + Total Short Value)
Long	Parsed Exposure	Total Parsed Long Value	Total Parsed Long Value / (Total Parsed Long Value + Total Parsed Short Value)
Short	Exposure	Abs(Total Short Value)	Abs(Total Short Value / (Total Long Value + Total Short Value))
Short	Parsed Exposure	Abs(Total Parsed Short Value)	Abs(Total Parsed Short Value / (Total Parsed Long Value + Total Parsed Short Value))

Gross and Net Exposure

Gross/net exposure only includes positions held and gross/net parsed exposure includes components of funds held in the portfolio. Key points to keep in mind: The lower the net exposure the lower the risk. If 100% long and 100% short, net exposure is 0%. If net exposure is negative, short exceeds longs positions and portfolio is net short.

Exposure	$	%
Gross Exposure	Total Long Value + Abs(Total Short Value)	Long Exposure % + Total Short Exposure %
Parsed Gross Exposure	Total Parsed Long Value + Abs(Total Parsed Short Value)	Parsed Long Exposure % + Total Parsed Short Exposure %
Net Exposure	Total Long Value + Total Short Value	Long Exposure % - Total Short Exposure %
Parsed Net Exposure	Total Parsed Long Value + Total Parsed Short Value	Parsed Long Exposure % - Parsed Short Exposure %

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Conclusion

Risk Measures and exposure are historical predictors of investment risk, volatility, leverage, and overall portfolio analysis. Risk measures assess the performance of a portfolio which can be compared to a specific benchmark.

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End Notes

1. The Risk Measures Benchmark Comparison Report shows the risk of your portfolio compared to the risk of up to three benchmarks. The standard risk measures calculations are the same as the Risk Measures Report.
2. Correlation and Tracking Error will only appear on the Risk Measures Benchmark Comparison Report.
3. Lipper is the fund data source used for parsed exposures. Parsed data is available for most but not all funds.

Version: 3.1 | Published: November 2025