Risk Measures White Paper

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.

VAMI (Value-Added Monthly Index)

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

Calculate VAMI

  1000 X [(1 + return)]   OR   Previous VAMI X [(1 + current return)]

Max Drawdown

The largest cumulative percentage decline in the Net Asset Value of your portfolio from the highest peak value to the lowest or trough value after the peak.

Calculate Max Drawdown

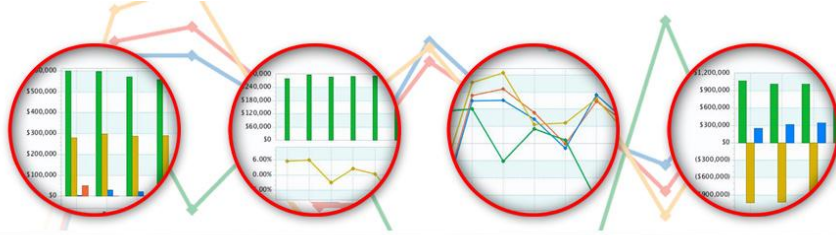[(VAMI or (1000 X (1 + return)) / (maximum VAMI during given time period) -1]

Notes:
  • The Max Drawdown is reflected as a positive number.

Max Drawdown Example

Date	TWR	VAMI	Max Drawdown
		1000	
4/1/2018	0.69%	1006.90	.69%
4/2/2018	-0.15%	1005.39	-.15%
4/3/2018	.012%	1006.60	-.03%
4/4/2018	1.66%	1023.31	1.63%
Max Drawdown			0.15%

Peak-to-Valley

The time period during which the max drawdown (largest cumulative percentage decline in the NAV) occurred. For example, if the highest NAV (peak) was on April 1st and the lowest NAV (valley) was on April 5th, the Peak-to-Valley would be 4/1 – 4/5.

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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

[(Annualized Account Return – Annualized Risk Free Rate) / Annualized Standard Deviation]

Where:	
Annualized Return	Average Return X n
Annualized Standard Deviation	Standard Deviation X $\sqrt{n}$
n	The period, ie. Daily = 360

Notes:
- The Risk Free Rate is the US 3 Month Treasury Bill.

Sharpe Ratio Example

Using n = 360:
If the average account return is .017677, the annualized account return is .017677 X 360 or 6.363723.

If the standard deviation is .162357, the annualized standard deviation is .162357 X $\sqrt{360}$ or 3.080508.

[(6.363723-1.37) / 3.080508] = 1.62
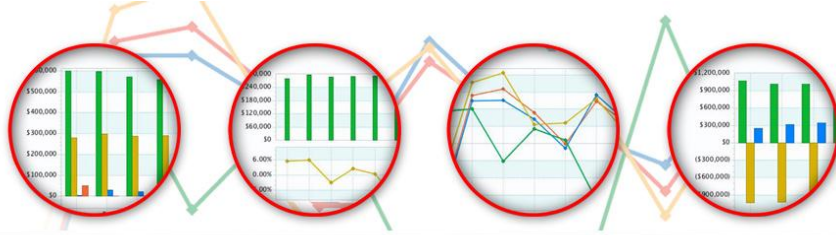
Sortino Ratio

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.

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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.

Calmar Ratio

A ratio used to determine return versus drawdown risk.

Calculate Calmar Ratio

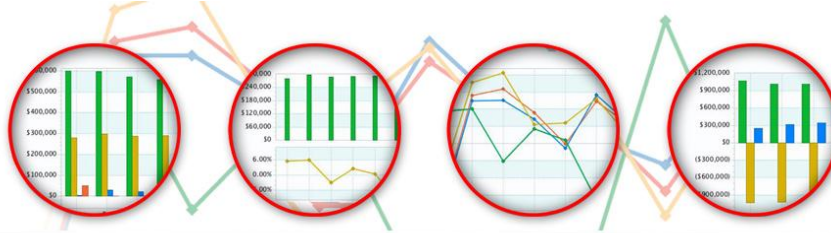Compound Annual Growth Rate / Maximum Drawdown

Standard Deviation

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

Calculate Standard Deviation

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

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

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Downside Deviation

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

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.
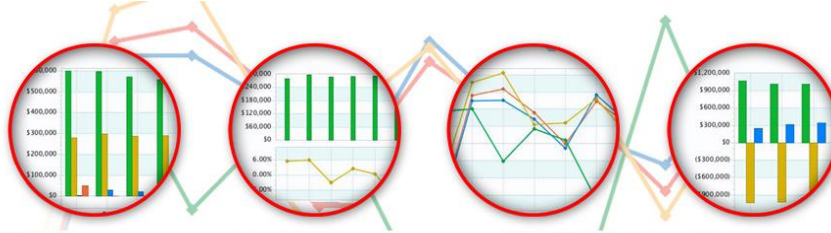
Calculate Correlation

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

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 X [(Portfolio Return Day 1 – Benchmark Return Day 1, (Portfolio Return Day 2 – Benchmark Return Day 2), etc.]

Mean Return

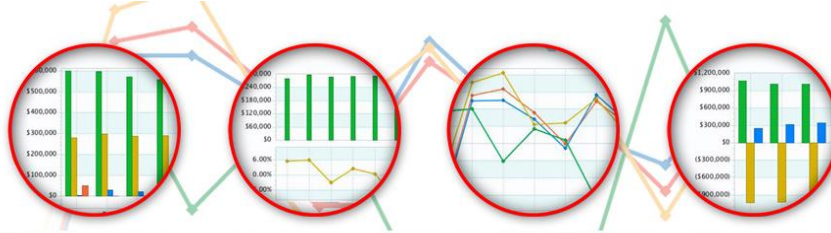The average time weighted return of your portfolio for a specified time period.

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 experience.

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 experience.

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.

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Conclusion

Risk Measures are historical predictors of investment risk, volatility, and overall portfolio analysis. These measures asses the performance of a portfolio which can be compared to a specified benchmark.

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.

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