PERFORMANCE MEASUREMENT AND MONITORING

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PART 1:
RETURN AND RISK

Web Search for London Hotel Room

Which is better deal?

- Site A: 300
- Site B: 275

Same hotel, equivalent room

Which is Preferred Manager (or System or Trading Method)?

Risk is denomination of return

	Return	Risk (Standard deviation)	Return/Risk Ratio
Manager A	10	5	2
Manager B	25	25	1

Assume no hidden risk and standard deviation a reasonable proxy for risk

But what if you are risk-tolerant and the higher return is more important?

Why Return Alone Is Meaningless

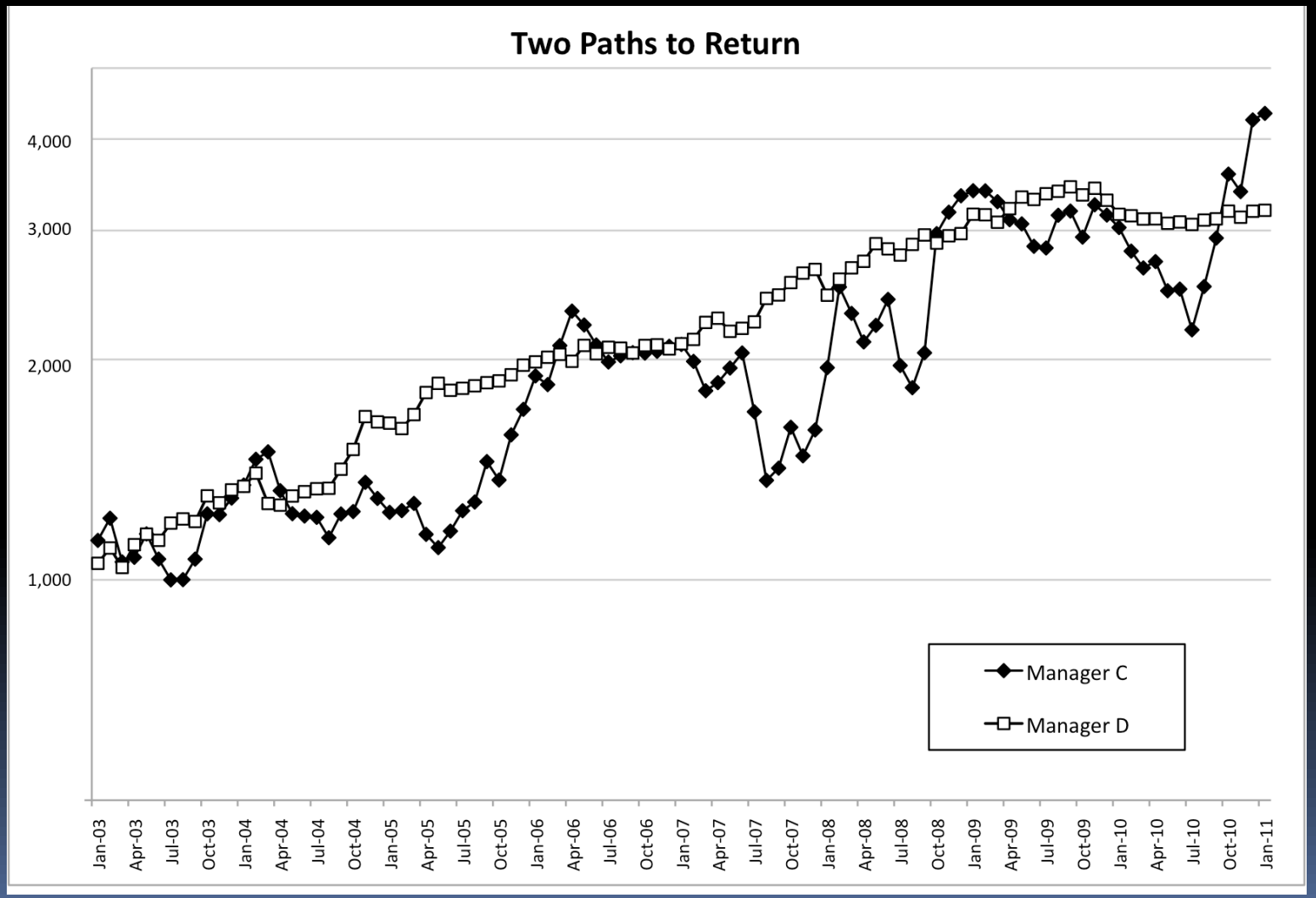
	Return	Risk (Standard deviation)	Return/Risk Ratio
Manager A	10	5	2
Manager B	25	25	1
Manager A 3X	30	15	2

Comparing returns without risk is as meaningless as comparing international hotel prices without the currency denomination

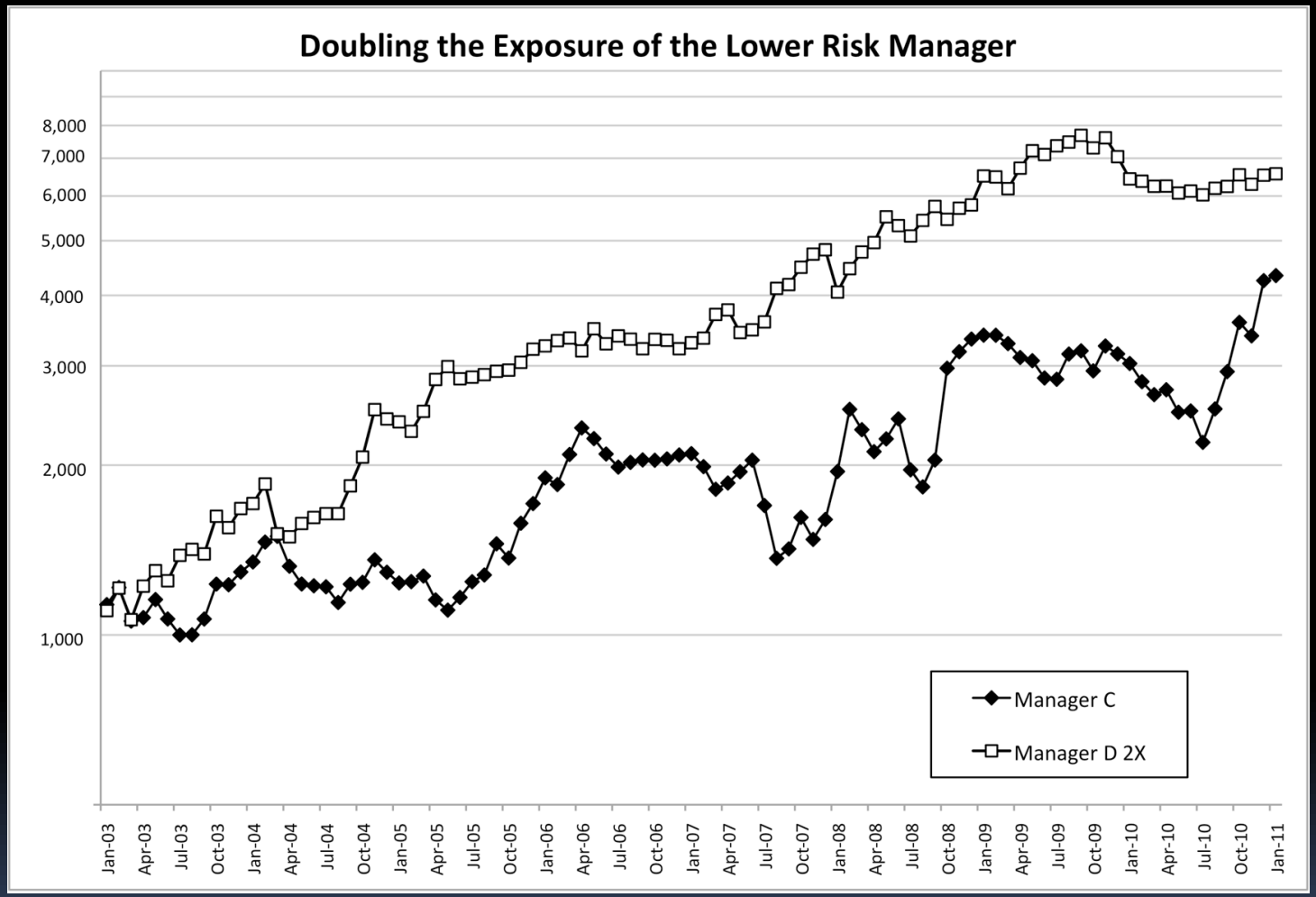
Risk is the denomination of return

The Leverage Shovel

Comparison of Two Managers



Comparison with Leverage (2X)

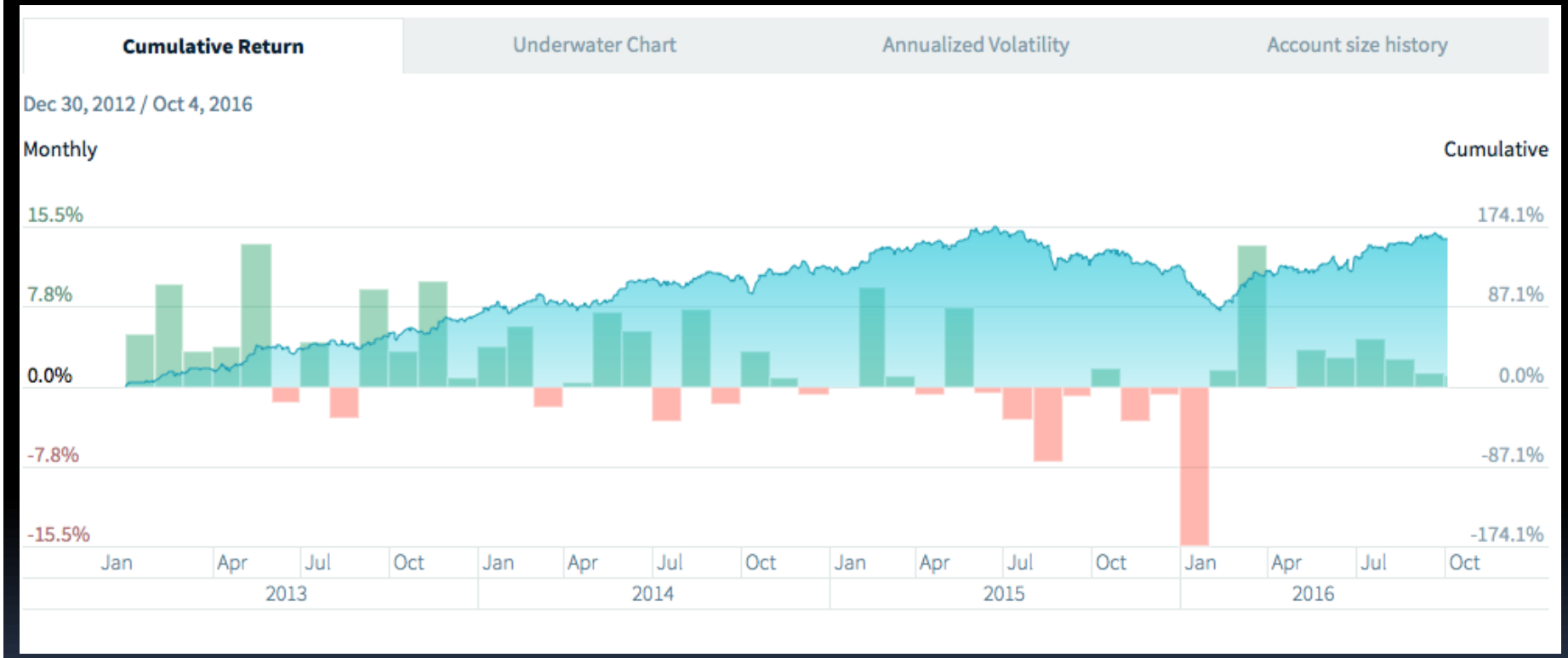


What if leverage not available?

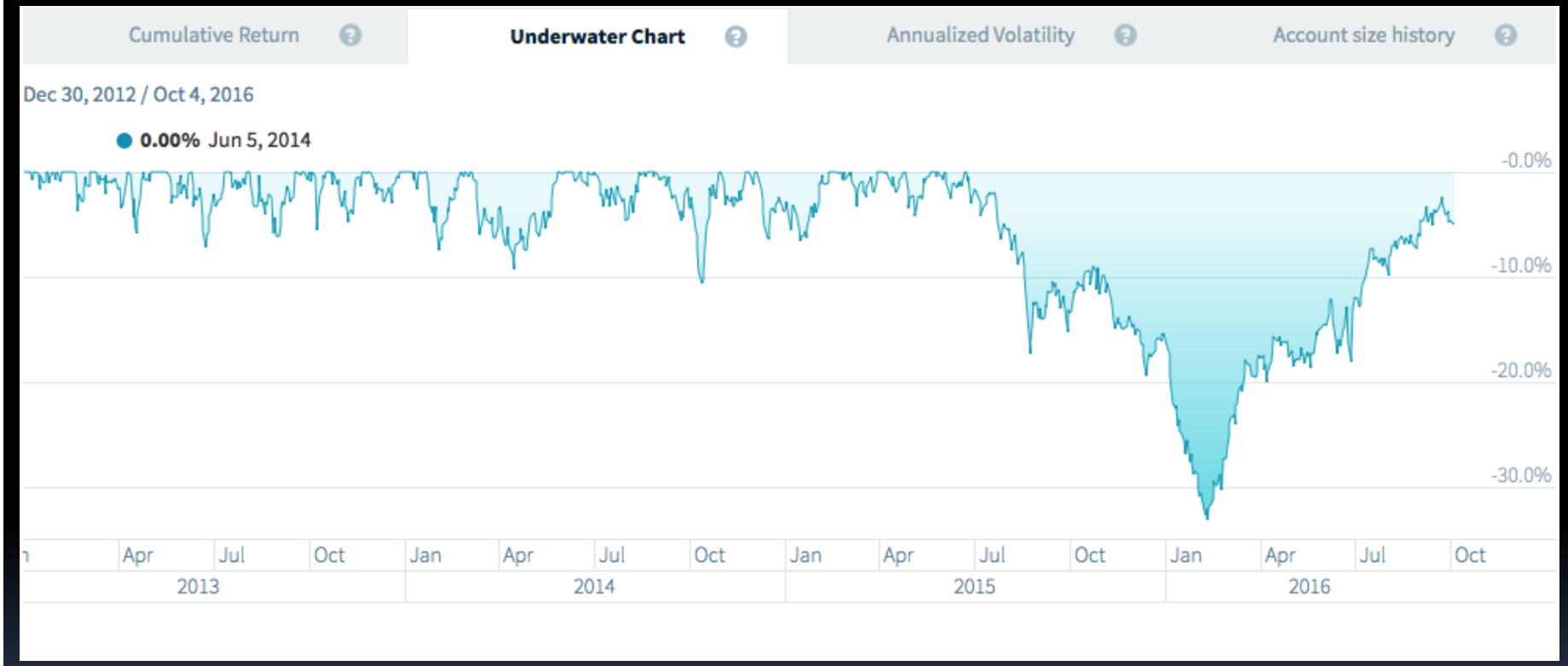
Risk of abandoning investment on drawdown

PART 2:
VISUAL PERFORMANCE MONITORING & EVALUATION

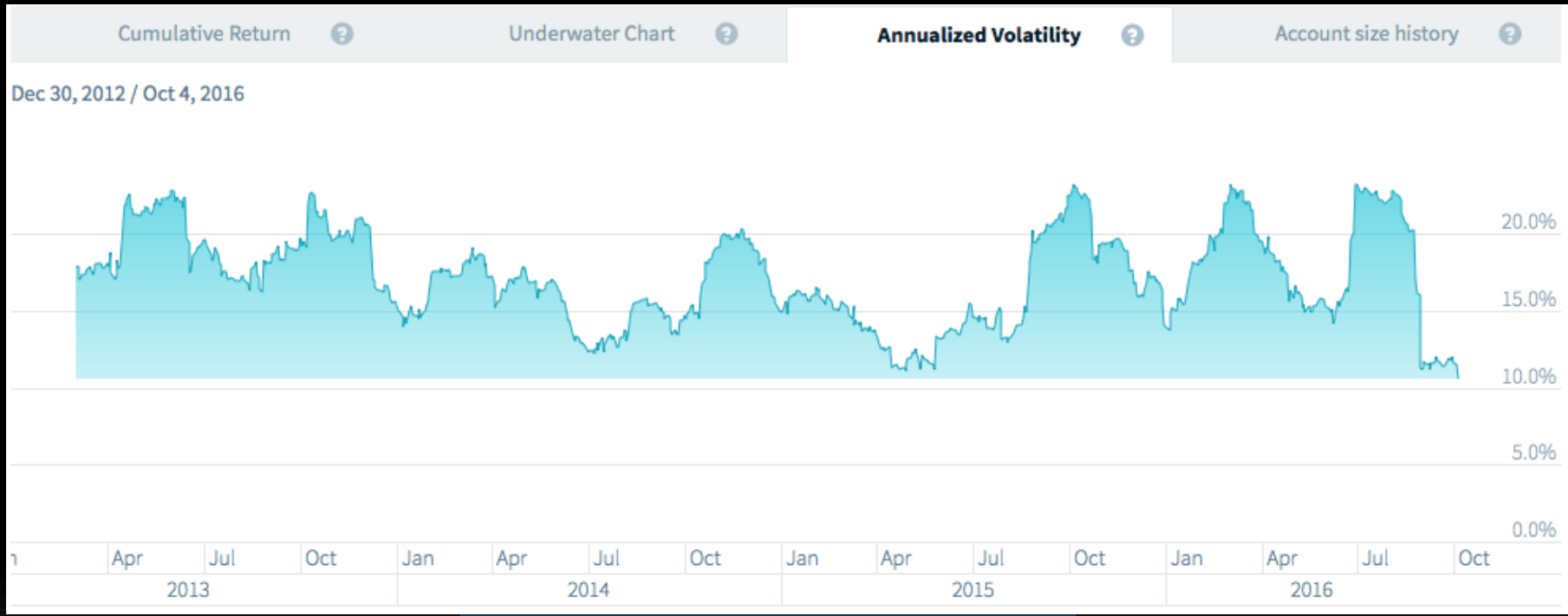
The Equity Curve



Underwater Chart

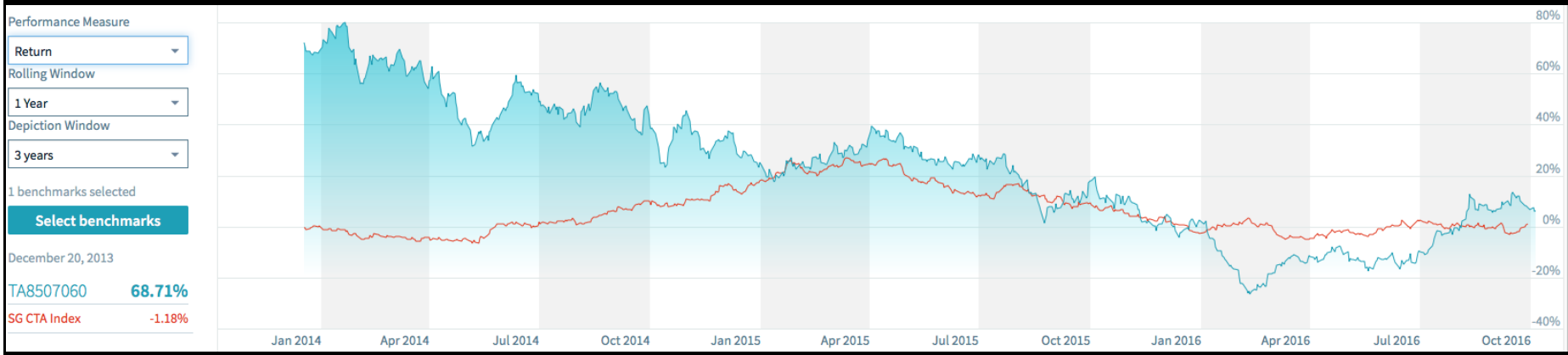


Volatility Chart

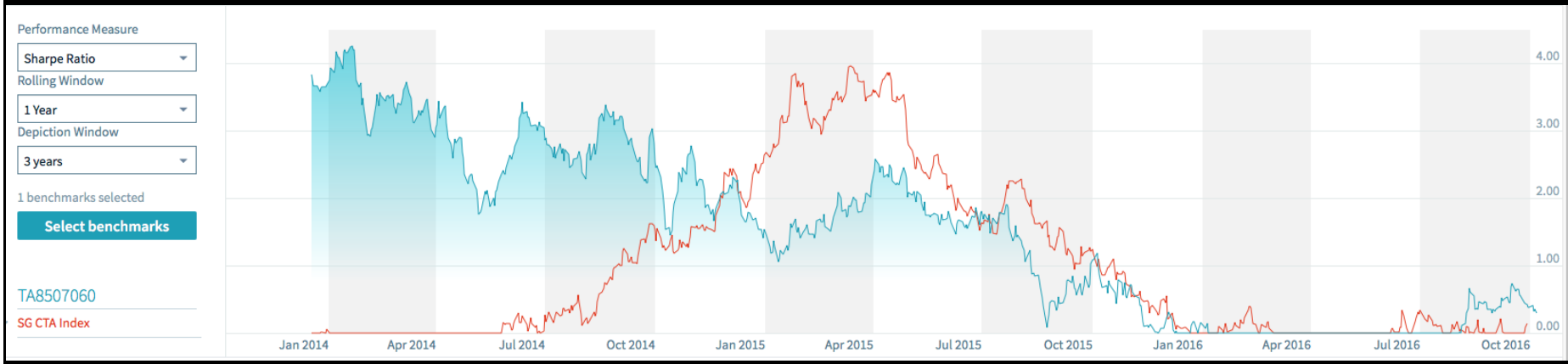


This chart depicts annualized daily volatility with daily volatility being calculated as the standard deviation of daily returns using a rolling 44-trading day lookback period (equivalent to approximately two months).

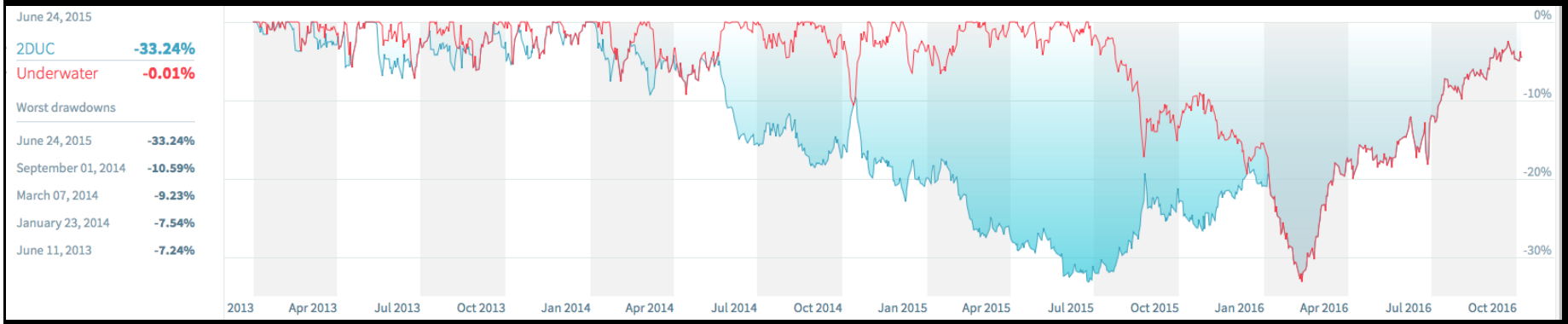
Rolling 12-Month Return



Rolling 12-Month Sharpe Ratio

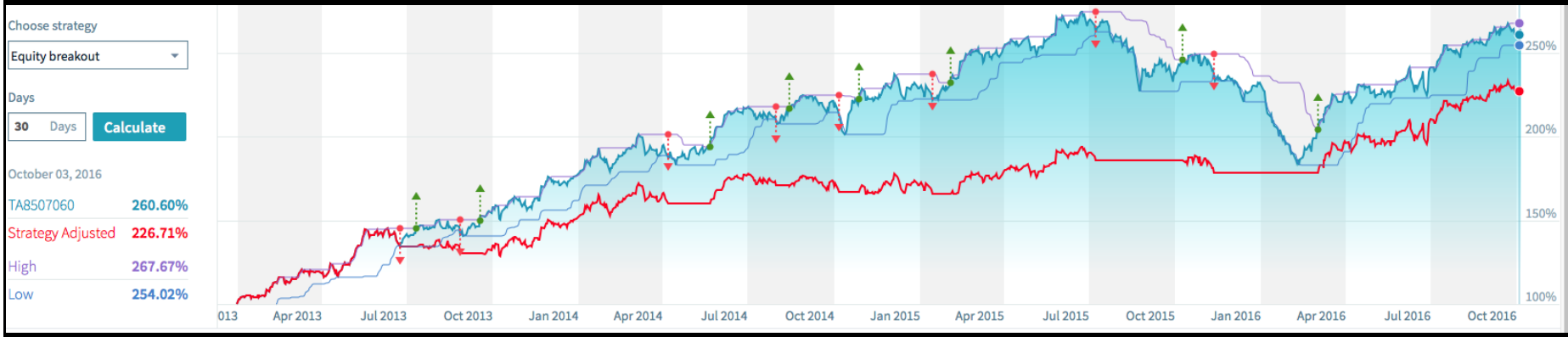


2DUC versus Underwater Chart

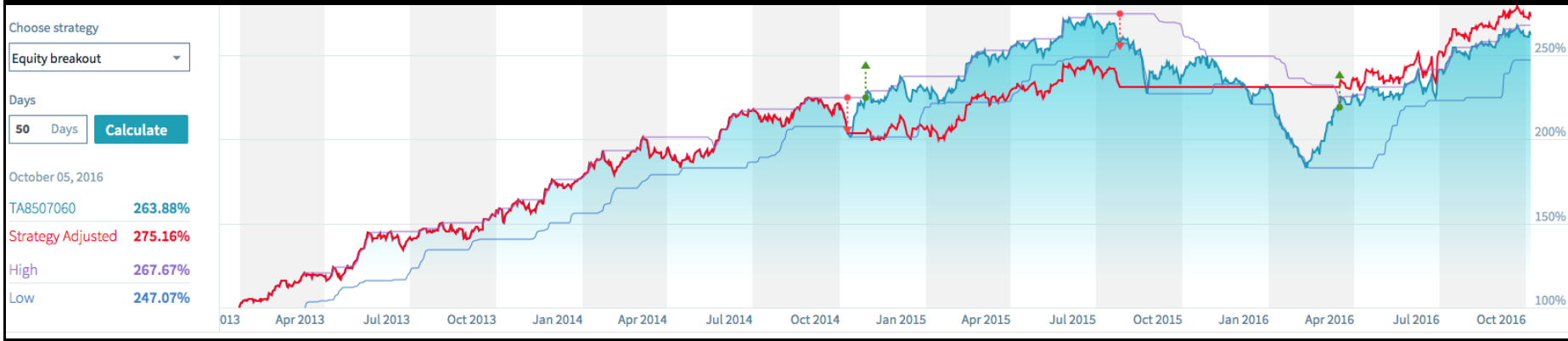


PART 3: APPLYING TECHNICAL ANALYSIS TO THE EQUITY CURVE

Equity Curve with 30-Day Breakout



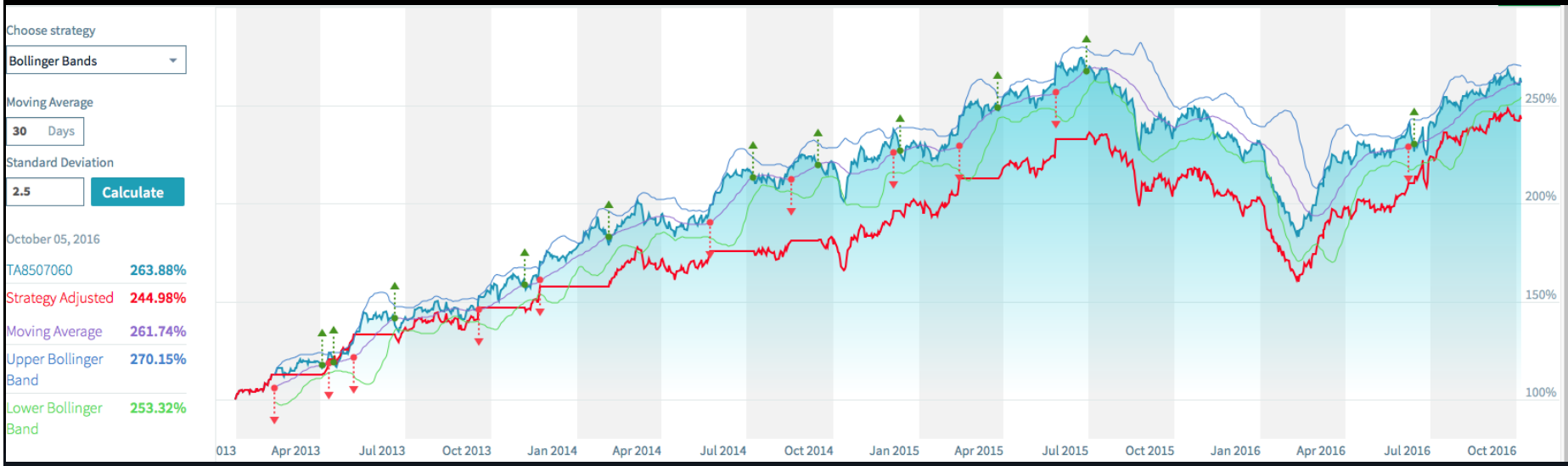
Equity Curve with 50-Day Breakout



Equity Curve with 8/40 Crossover

Equity Curve 5% Retracement 3% Re-entry

Equity Curve with Bollinger Bands



PART 4: RETURN/RISK PERFORMANCE MEASURES

Standard Deviation (Volatility) as Risk Measure

- A measure of dispersion
- If returns normally distributed, 95% of returns will be within 2 standard deviations of mean
- For example, if average annual return is 15%, then 95% of the time we would expect return to be in range of:

For SD = 20: -25 and +55

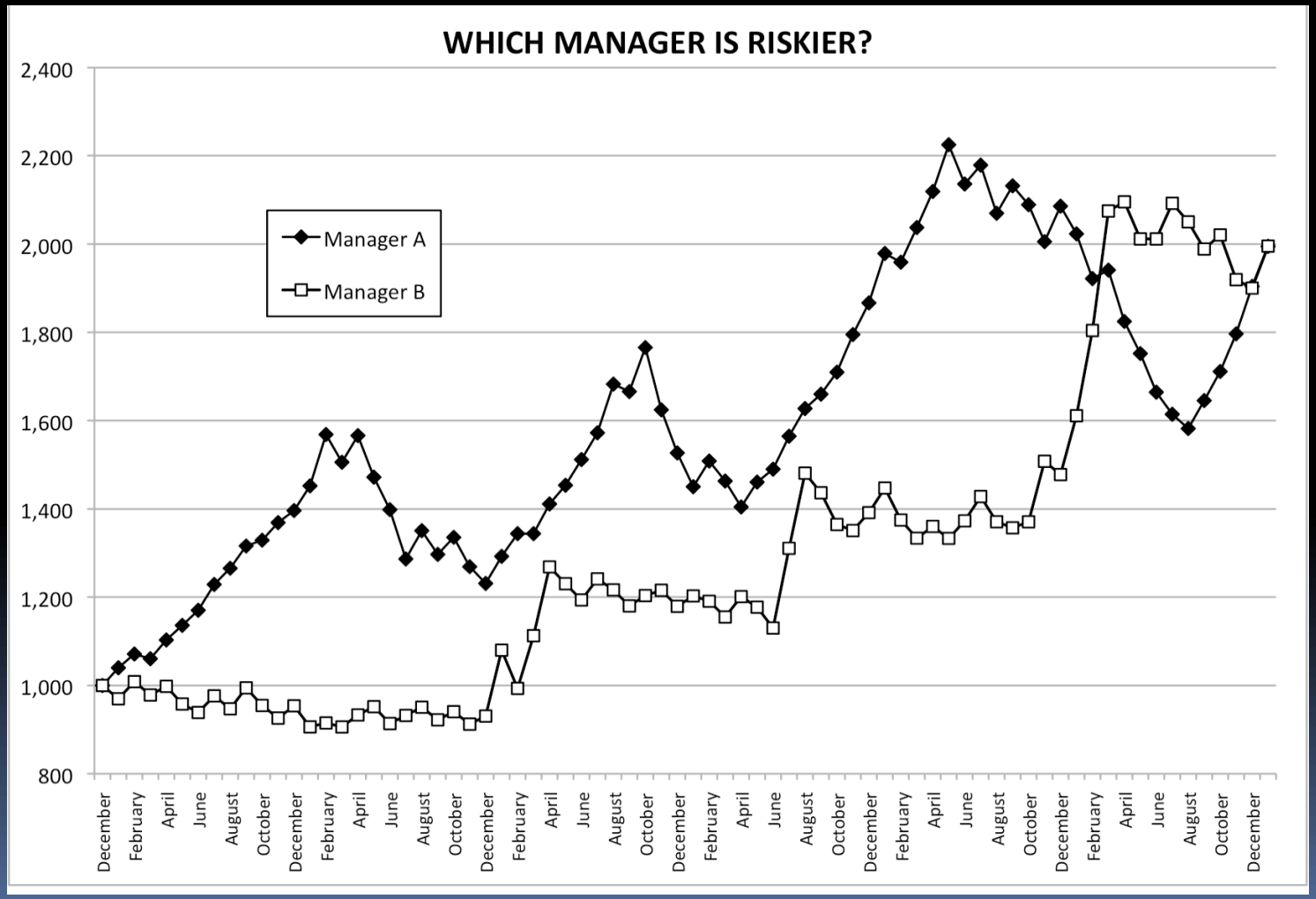
For SD = 5: +5 and +25

Sharpe Ratio

Sharpe Ratio = (R – I)/ SD, where

- R = return
- I = risk free interest rate
- SD = standard deviation

Two Managers with Same Return: Which Has Higher Sharpe Ratio?



Problems with the Sharpe Ratio

- Does not distinguish between upside and downside volatility
- Does not distinguish between Intermittent and consecutive losses
- Meaningless for negative returns
- Leverage increases Sharpe ratio

Other Return/Risk Measures

- Sortino Ratio—Return/downside risk
- Gain-to-Pain Ratio—Sum returns/sum losses
- MAR and CALMAR Ratios—Return/MD

Misinterpretation of Sortino Ratio

- As conventionally calculated, the Sortino ratio will be approximately double the Sharpe ratio even for symmetrically distributed returns
- Recommendation: Divide Sortino ratio by square root of 2; this will make it comparable with Sharpe ratio
- Implications: A Sortino Ratio divided by square root of 2 greater than Sharpe ratio implies returns right skewed (i.e., deviations more influenced by large positive returns); lower would imply returns negative skewed

Advantages of Gain to Pain Ratio (GPR)

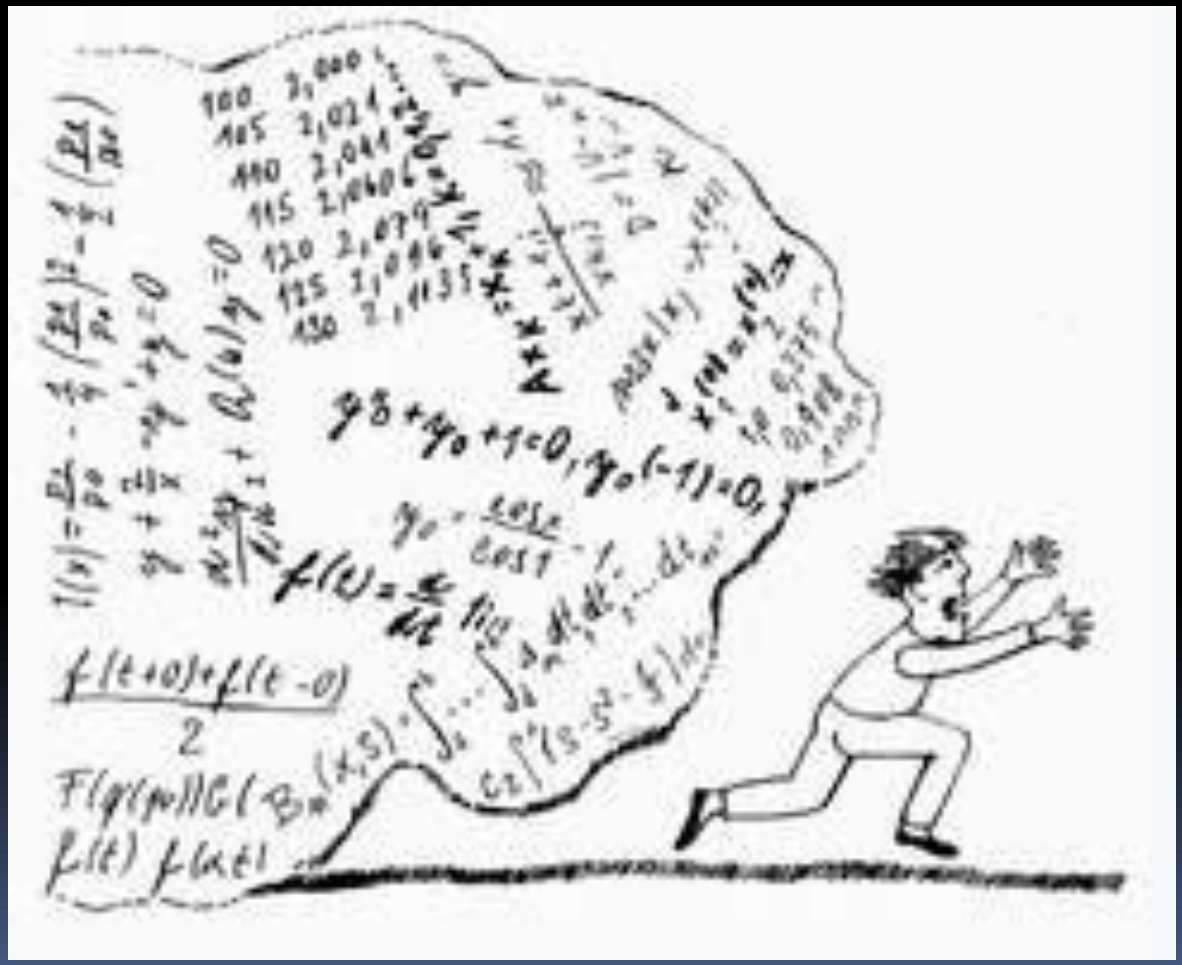
1. Penalizes only for negative returns
2. Counts all negative returns and in proportion to their size
3. Intuitive meaning
4. Easy to calculate
5. Increasing leverage will not increase GPR
6. Defined for negative returns (i.e., smaller negative GPR always better than larger negative GPR)

Source for Performance Analytics

- The charts and statistics used in this webinar were taken from FundSeeder.com
- These analytics are available for free
- IB clients can directly link their accounts to the site to apply the charts, statistics and trading tools to their own equity curve.
- Once linked equity curve will update automatically every day.

APPENDIX: PERFORMANCE MEASUREMENT FORMULAS

If this is you…



SHARPE RATIO

$$SR = \frac{AR - RF}{SD}$$

SR =Sharpe ratio
AR = Average return (used as proxy for expected return)
RF = Risk free interest rate (e.g., T-bill return)
SD = Standard deviation

The standard deviation is calculated as follows:

$$SD = \sqrt{\frac{\sum_{I}^{N}\left(X - \overline{X}\right)^2}{N-1}}$$

Where ,

$\overline{X}$ = Mean
X_i = Individual returns
N = Number of returns

Assuming monthly data is used to calculate the Sharpe ratio, as is most common, the Sharpe ratio would be annualized by multiplying by the square root of 12. Note the return is an arithmetic average return, not the compounded return.

SORTINO RATIO

$$SR = \frac{ACR - MAR}{DD}$$

Where,

SR =Sortino ratio
ACR = Annual compounded return
MAR = Minimum acceptable return (e.g., 0, risk free, average)
DD = Downside deviation

Where DD is defined as:

$$\mathrm{DD} = \sqrt{\frac{\sum_{i}^{N} \left(MIN\left(X_i - MAR, 0 \right) \right)^2}{N}}$$

X_i = Individual returns
MAR = Minimum acceptable return (e.g., zero, risk-free return, mean)
N = Number of data values

For example, if we define MAR 0, then DD calculations will include only deviations for months with negative returns (the other months will equal zero).

GAIN-TO-PAIN RATIO (GPR)

$$GPR = \frac{\sum_{i=1}^{N} X_i}{\left| \sum_{i}^{N} MIN(X_i, 0) \right|}$$

Where,

X_i = Individual returns

MAR AND CALMAR RATIOS

$$MAR = \frac{ACR}{1 - MIN\left(\frac{NAV_j}{NAV_i}\right)}$$

Where,

ACR = Annual compounded return (expressed in decimal form)
NAV= Net asset value
j > i