



## Non-Traditional Risk Metrics for the Non-Traditional Manager

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As the portfolio allocation trend is shifting from a “traditional asset allocation” approach to a “non-traditional asset allocation” approach, we should explore the financial concepts of risk.

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## RE-VISITING THE CONCEPT OF RISK

What are some of the questions investors are asking about risk?

What fluctuations can be expected?

How often can these fluctuations occur?

What have been the most extreme losses?

How is the performance relative to its benchmark,  
if applicable?

How much has an investment had in  
losses at any point in time?

## DIFFERENT DEFINITIONS OF RISK

Risk can be viewed differently depending on the investment mandate. Some objectives have relative return mandates with a goal to outperform a specific benchmark. Non-traditional managers have absolute return mandates with a goal to beat 0.

Defines risk as statistical uncertainty (also known as standard deviation). A widely used interpretation of risk since the 1950's, volatility generally measures the variance of returns from the average return. Deviations from the average, positive or negative, are viewed as risk.

Observes the possibility of rare events. These events are rare, but can result in extreme losses (or gains).



Defines risk as relative performance against a benchmark. Gained increasing popularity in the 1990's due to active managers trying to outperform some benchmark. Risk is grouped into style boxes.

Defines risk as the peak to trough loss of capital. Increasingly relevant in current conditions as the end investor is most concerned with the bottom-line return on capital.

COMMON MODERN-PORTFOLIO THEORY RISK METRICS

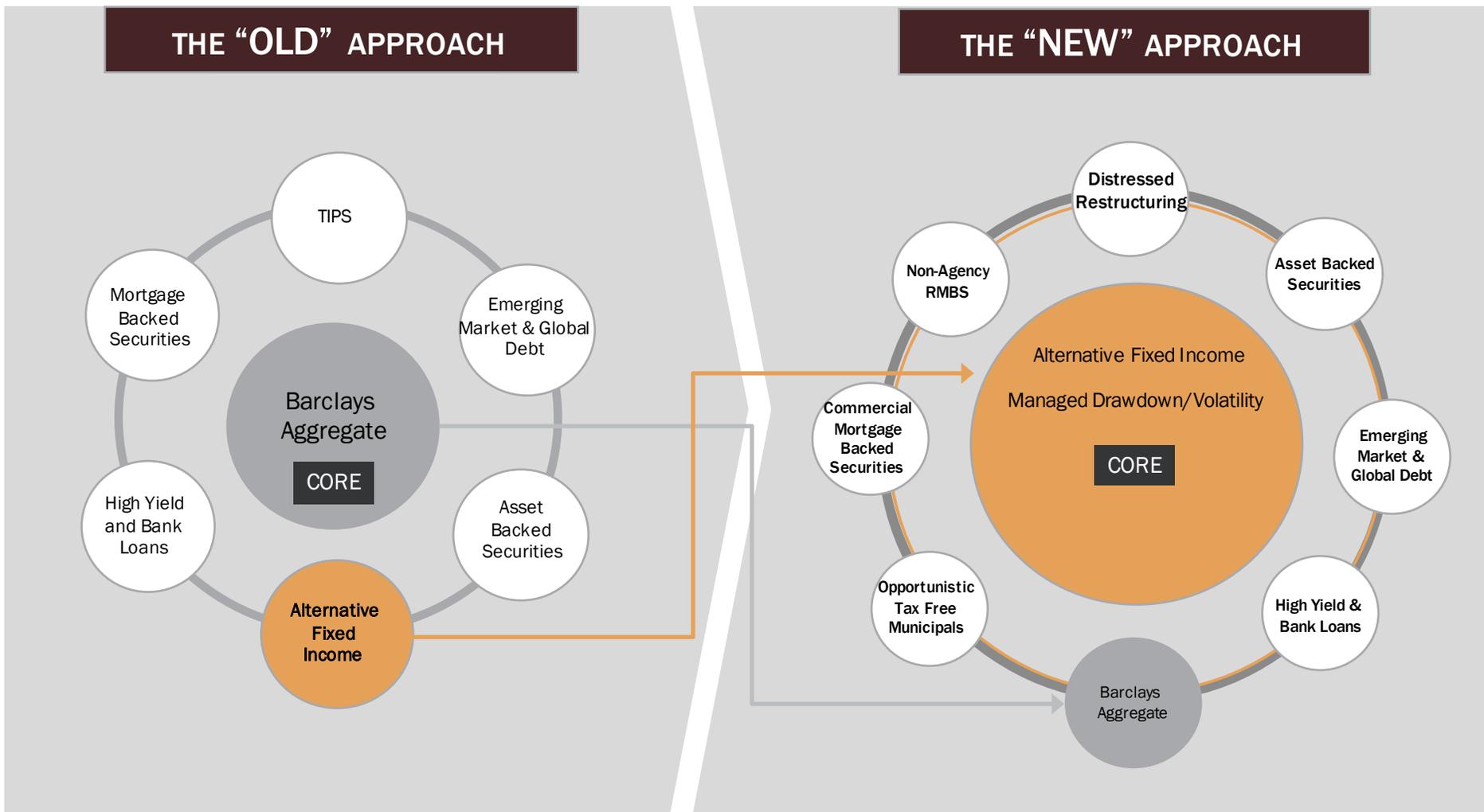
Traditional risk/return metrics, commonly used in the investment community, limit important information, which can be useful in making an investment decision.

# Risk Types

	Return-Metric	Risk-Metric	Return vs. Risk
<b>VOLATILITY</b> Uncertainty	Most Common	Standard Deviation	Sharpe Ratio
<b>BENCHMARK</b> Relative	Most Common Excess Return Up Capture	Beta Down Capture	
<b>TAIL RISK</b> Extremes	Most Common	Skew	Kurtosis
<b>DRAWDOWNS</b> Loss of Capital			

# TRADITIONAL FIXED INCOME VS. "NEW" FIXED INCOME

The old approach of traditional asset allocation is shifting to non-traditional asset allocation...



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FINDING THE RIGHT METRIC

Exploring statistical metrics that are not widely used by traditional money management firms can help paint a clearer picture on how to truly measure return and risk.

# Risk Types

		Return-Metric	Risk-Metric	Return vs. Risk
<b>VOLATILITY</b>	Most Common		Standard Deviation	Sharpe Ratio
	<b>Alternatives</b>		<b>Downside Deviation</b>	<b>Sortino Ratio</b>
Uncertainty				
<b>BENCHMARK</b>	Most Common	Excess Return Up Capture	Beta Down Capture	
	<b>Alternatives</b>	<b>Bull Beta</b>	<b>Bear Beta</b>	
Relative				
<b>TAIL RISK</b>	Most Common	Skew	Kurtosis	
	<b>Alternatives</b>	<b>Upside Omega</b>	<b>Downside Omega</b> <b>Maximum Drawdown</b>	<b>Omega Ratio</b>
Extremes				
<b>DRAWDOWNS</b>	Most Common			
	<b>Alternatives</b>		<b>Drawdown</b> <b>Pain Index</b>	<b>Calmar Ratio</b>
Loss of Capital				

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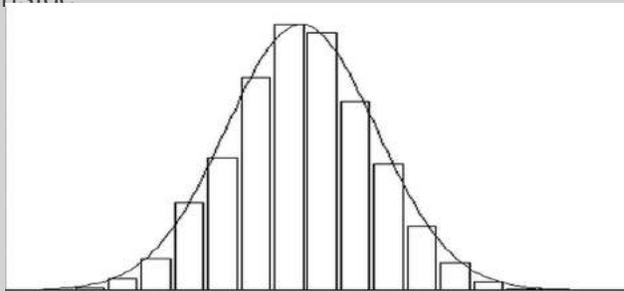
COMMON STATISTICS: WHEN CAN WE AFFORD TO ASSUME?

**ASSUMPTIONS**

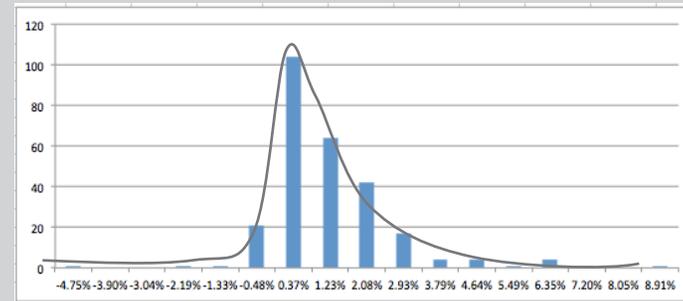
vs.

**REALITY**

**Returns follow a normal distribution.**  
 Most risk metrics are built upon the assumption of symmetrical returns. For example, standard deviation represents equal deviation around the center. It is a good estimation for volatility both upside and downside



**Distributions can be skewed or peaked.**  
 Realistic returns can be asymmetric. This can be especially true in absolute return mandates. A manager could have more positive variability than negative variability making statistics like standard deviation difficult to interpret.



**Correlations between assets are constant.**  
 Holding assets that are historically low correlated calculated today will diversify a portfolio and lower systematic risk in the future.

**Market-wide selloffs are market-wide.**  
 During times of market crisis, correlations tend to converge much higher. Diversification may fail when it is needed the most.

**Investors are rational and risk-averse.**  
 If an investor invests in a risky asset associated with possible returns, he or she will experience the full spectrum of both risk, and return.

**Investors are driven by emotion.**  
 In times of losses, an investor may have a higher tendency to sell out. In these cases, an investor may experience the risk, without receiving the other end of returns through a recovery.

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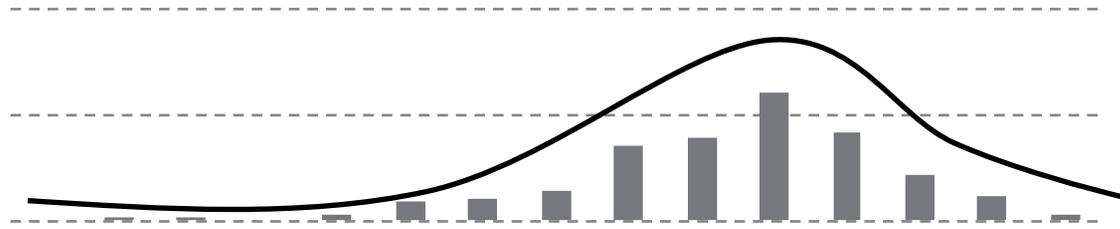
# ASYMMETRY IN RETURNS AND NON-TRADITIONAL MANDATES

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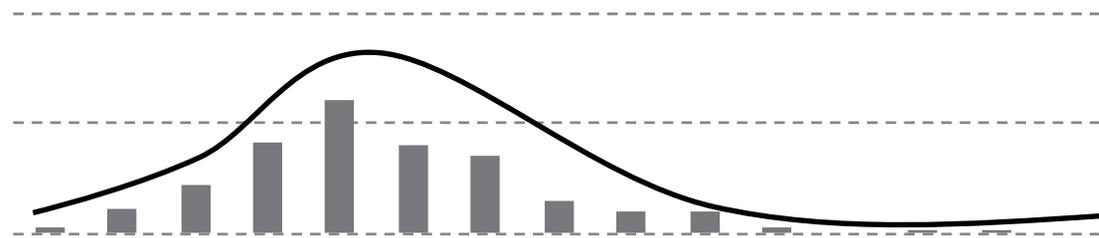
Volatility is good, provided that it is on the upside. A normal distribution has a skew of 0. Standard Deviation does not take any of this into consideration.

## Illustrating Skew:

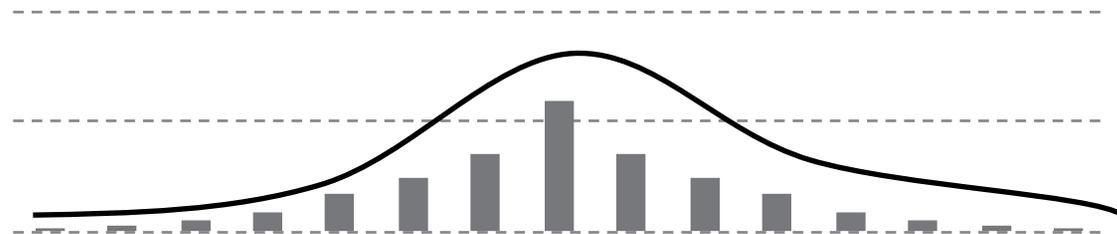
Shown to the right, a negative skew indicates higher returns more often, but greater extremes in negative returns.



Shown to the right, a positive skew indicates smaller returns more often with chances of larger returns, but less likelihood of extreme losses.



Shown to the right a skew of 0. Standard Deviation calculates the variation from the mean and assumes upside and downside variance to be equal.



Calculating the skew can provide a good indication of the general returns distribution, however it remains difficult to interpret. Managers who focus on limiting downside risk tend to desire providing positive skew returns, often opting to consistently produce smaller returns while limiting losses. In such cases, standard deviation can penalize a manager who has a higher variance in positive returns.

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## SOME VOLATILITY AND TAIL RISK ALTERNATIVES

### DOWNSIDE DEVIATION

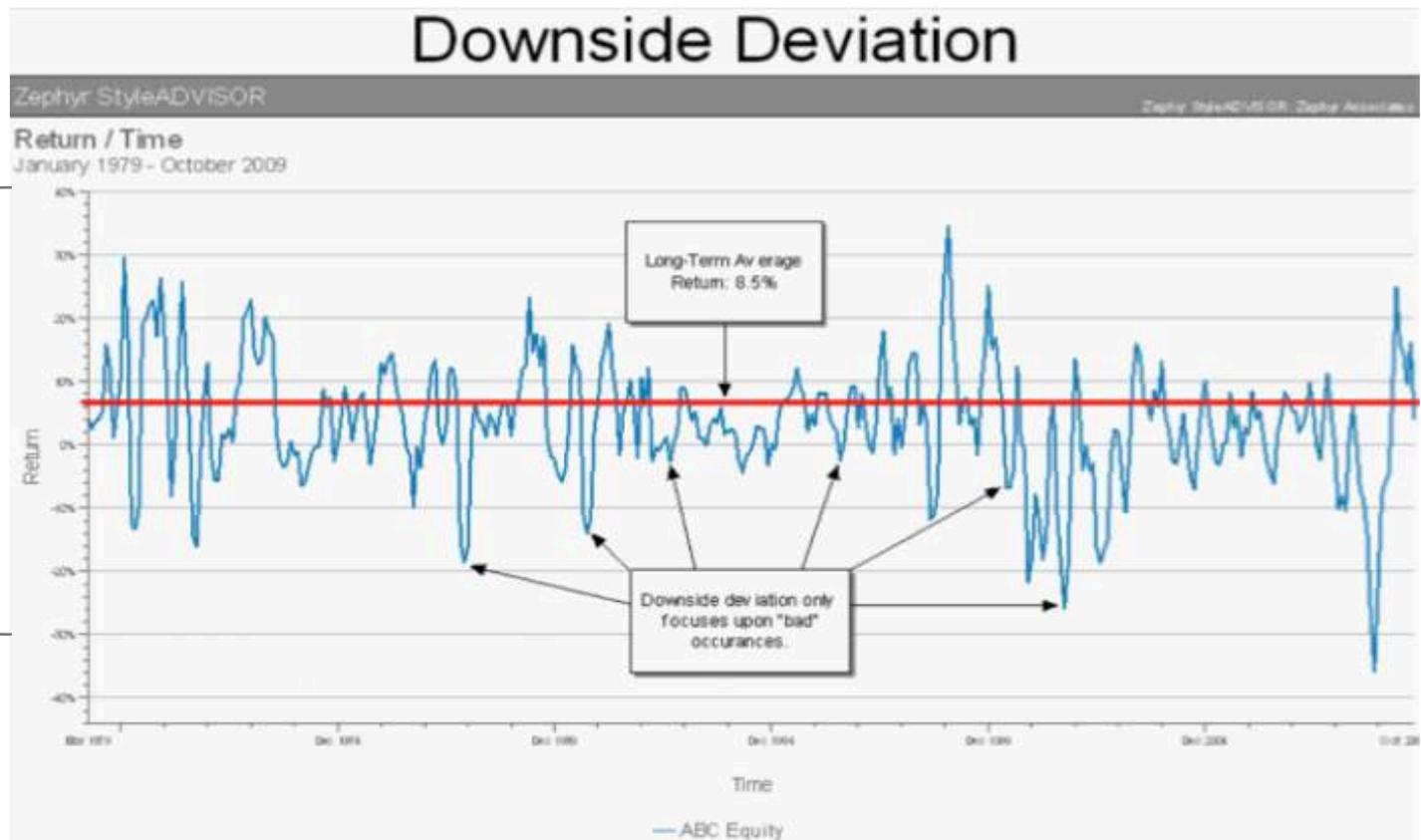
↳ The lower, the better.

Downside deviation measures the price volatility of a security, but unlike standard deviation, downside deviation isolates the downside movement by only calculating the times when the price falls below a defined Minimum Acceptable Return (MAR). While difficult to explain exact implications as a metric, downside deviation does not penalize a manager for positive variance.

### ILLUSTRATING CONCEPT OF DOWNSIDE DEVIATION

Standard Deviation:  
Good and Bad Volatility

Downside Deviation:  
Bad Volatility Only



Source: Zephyr, Redwood. For illustration purposes only. Please see disclosures at the end for additional information.

## SHARPE RATIO VS. SORTINO RATIO

Return/Risk Tradeoffs:

Return per Risk =

$$\frac{\text{Return}}{\text{Risk}}$$

Traditional:

Most commonly used Sharpe ratio uses standard deviation as risk, incorporating both good and bad volatility



Sharpe Ratio =

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

Alternative:

Not as common Sortino Ratio risk extrapolates the good volatility from the bad volatility.



Sortino Ratio =

$$\frac{\text{Return} - \text{Risk Free Rate}}{\text{Downside Deviation}}$$

SOME VOLATILITY AND TAIL RISK ALTERNATIVES

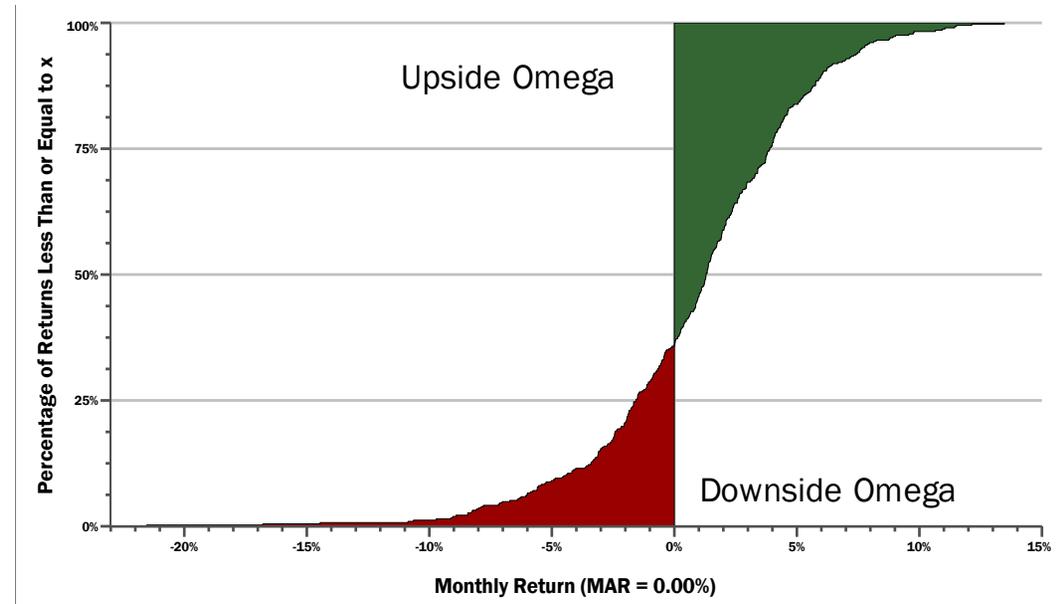
OMEGA

The higher, the better.

A newer idea that captures the concept of skew is omega. Omega considers the amount of skew in a distribution around some point. While complicated to calculate, the idea of comparing omega is simple. Omega displays the ratio between the amount of positive returns in a distribution over negative returns.

ILLUSTRATING CONCEPT OF OMEGA

- Sort all series of returns from least to greatest
- Graph the series with: Y axis as 1/(number of data points) as a % X axis as the return
- Pick a MAR (lets say 0%)
- Area above is Upside Omega
- Area below is Downside Omega
- $$\text{Omega} = \frac{\text{Upside Omega}}{\text{Downside Omega}}$$



IMPLICATIONS OF OMEGA

OMEGA < 1

More overall losses than gains

OMEGA = 1

Equal losses and gains

OMEGA > 1

More overall gains than losses

Source: Redwood. For illustration purposes only. Please see disclosures at the end for additional information.

## WHAT IS BETA?

Beta is used as a relative volatility metric against a static benchmark. Perhaps a reason many people like to compare beta because it is easy to explain. For example:

Manager Beta = 0.50 against S&P 500



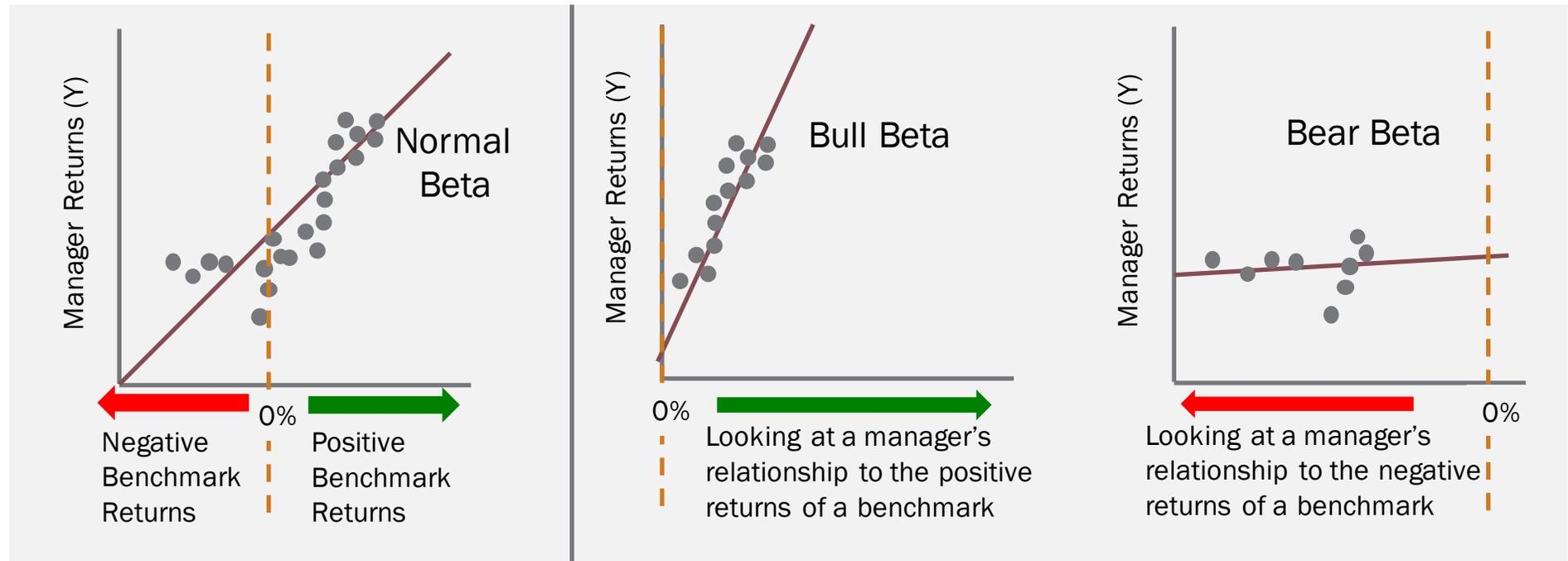
Similar to standard deviation, however, beta can have flaws:

- Like standard deviation, beta assumes that a manager's upside relative to a benchmark is the *same* as a manager's downside.

ALTERNATIVE BETA FOR TACTICAL CHANGES: BULL/BEAR BETA

Risk mandated managers often seek to lower downside risk. For example, a manager may utilize a tactical strategy where the strategy's goal is to be invested during market uptrends, and conversely, on the sidelines during market down-trends. Similar to the goal of downside deviation, Bull/Bear Betas attempt to isolate the good from the bad times.

Illustration: Splitting Beta: Bull Beta and Bear Beta



Beta Implications

**Unclear:** can be interpreted differently. Used widely to compare passive investments relative to a benchmark.

Bull Beta Implications

The **higher** the number, the better. Used to see an active manager's historical positive participation.

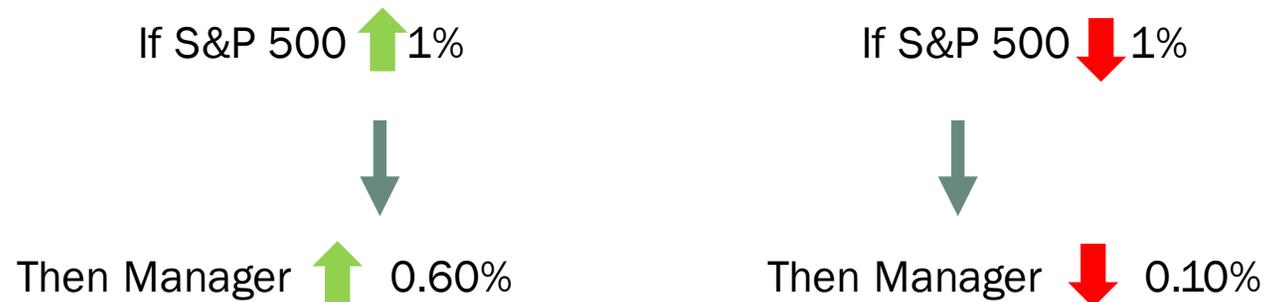
Bear Beta Implications

The **lower** the number, the better. Used to see an active manager's strategy when the benchmark is negative.

## INTERPRETING BULL AND BEAR BETAS

Bull and Bear betas help isolate what is important to an end investor: how does a manager perform in a rising market, and how does a manager perform in a declining market. For example:

Bull Beta = .60 | Bear Beta=.10



Following the concept of downside-deviation, Bull/Bear betas provides more accurate information, which is useful in looking at non-traditional managers who have a focus on limiting downside risk:

- Managers focused on limiting downside risk have a goal to specifically be unassociated in down markets. Bull beta could be a good estimation of a tactical manager's participation in up-markets, while bear beta shows a manager's discipline to limit risk in down markets.

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## RISK METRICS APPLIED TO THE NON-TRADITIONAL MANAGER

There are many ways to define risk, but really only one way for a client to define return.

*Simply speaking, for an absolute return manager, return is the appreciation of capital. Then why shouldn't risk simply be the depreciation of capital?*

Especially prevalent in tactical strategies, traditional volatility metrics can be an overall poor representation of a manager's distributions given the many assumptions needed.

Tail risk metrics also often rely on normal distribution of returns. The possibility of what matters most: "extreme losses" are also captured viewing maximum drawdowns.



Managers who employ tactical strategies can have changing exposure to manage risk and seek to produce absolute returns. Relative mandates can outperform benchmarks even when they are losing money.

Measures risk as the negative returns of a manager.

Total Return  
(End Value - Beginning Value)

## DRAWDOWNS AND MAXIMUM DRAWDOWN

### Definition:

An easily understandable risk metric is “drawdown.” A drawdown is the measure of the peak to trough percentage loss during a given time period. Maximum drawdown is the largest drawdown in that time period. This measures actual capital depreciation that occurred.

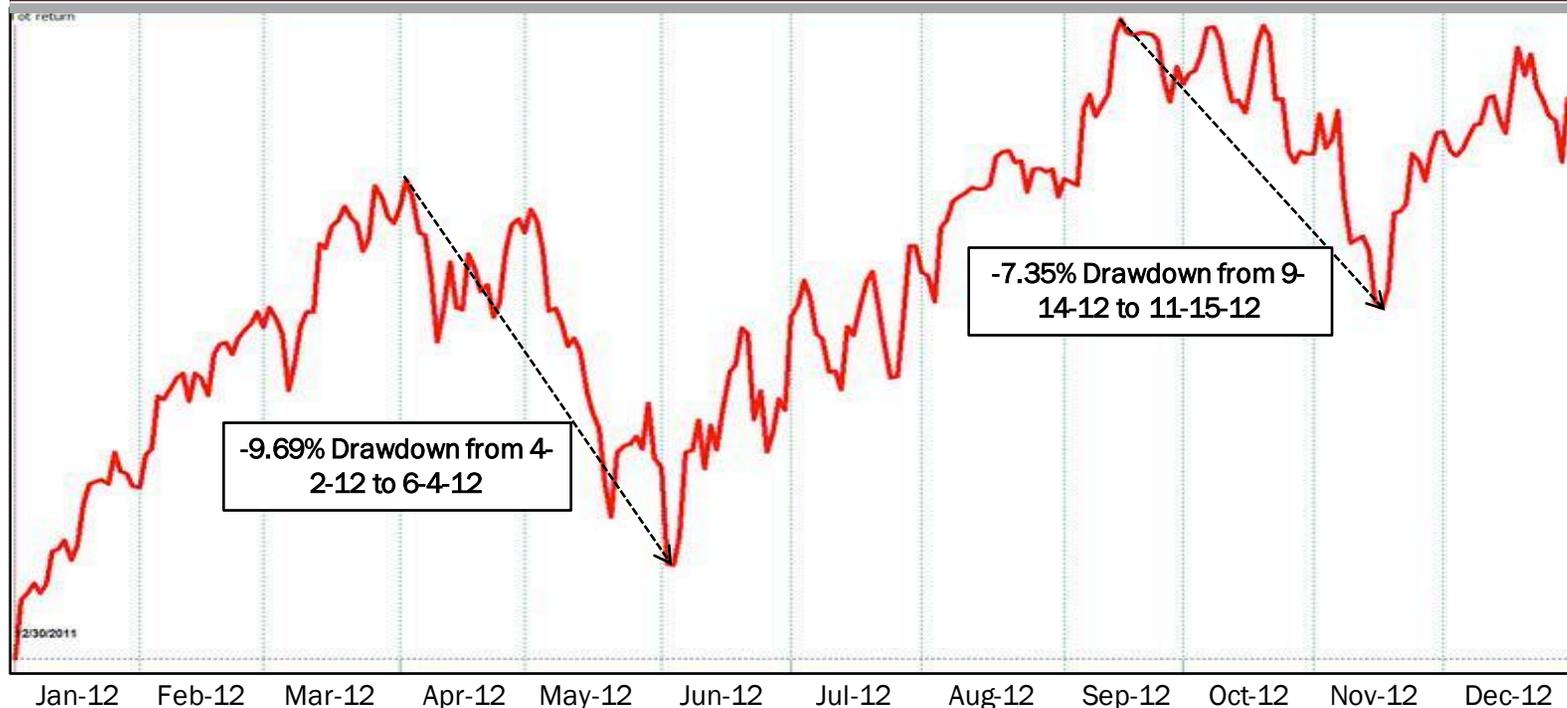
### Interpretation:

Maximum drawdown shows the most extreme cumulative losses in a given period.

### Limitations:

Maximum drawdown is a one time measure. A set of returns can have lower maximum drawdowns, but more frequent.

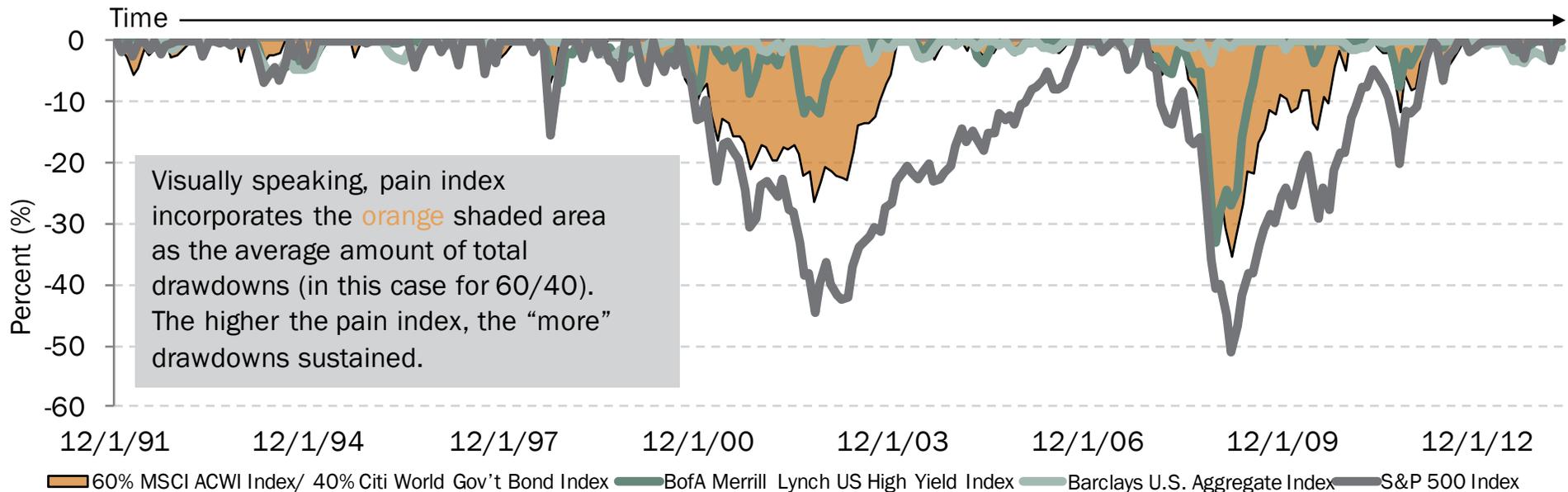
### EXAMPLE OF DRAWDOWNS: 2012 DRAWDOWN S&P 500 ETF (SPY)



Source: Fastrack. These charts are opinions and should not be construed as facts. For illustration purposes only. Please see disclosures at the end for additional information.

**DRAWDOWNS: PAIN INDEX**

The Pain Index presents a metric that presents the amount of total “drawdowns” in an analysis period. This measures the average value of drawdowns over time incorporating depth, duration, and frequency of losses. This metric can be useful in determining the average total drawdowns over the entire period, rather than just a one time maximum drawdown metric.



January 1, 1992 – March 31, 2014	MAXIMUM DRAWDOWN	PAIN INDEX	STANDARD DEVIATION	SHARPE RATIO	DOWNSIDE DEVIATION (MAR=0)	SORTINO RATIO (MAR=0)
Barclays U.S. Aggregate	-5.15%	0.71%	3.66%	0.84	1.88%	3.20%
BofA Merrill Lynch US High Yield	-33.22%	2.06%	8.54%	0.66	5.77%	1.49%
60% MSCI ACWI Index / 40% Citi World Gov't Bond Index	-35.52%	5.04%	9.97%	0.43	6.52%	1.11%
S&P 500 Index	-50.95%	10.63%	14.61%	0.43	9.84%	0.93%

Source: Zephyr. For illustration purposes only. Please see disclosures at the end for additional information.

## REDWOOD'S FOCUS ON CLIENT-RISK

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Ultimately, the goal of any investor, retail or institutional is to produce returns on capital. However, most investors (private client) have risk constraints, which often puts a limitation on the upside opportunity. Thus, it is essential that an investor evaluate returns per-unit-of-risk.

## WHERE WE FIT: ALLOCATION BY ANNUAL DRAWDOWNS

## ANNUAL DRAWDOWNS BY CALENDAR YEAR

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	YTD*
Conservative -2.17%	Conservative -1.38%	High Yield -0.44%	Bar Agg -1.05%	Bar Agg -3.83%	Bar Agg -1.56%	Bar Agg -1.65%	Bar Agg -0.29%	Bar Agg -0.57%	S&P 500 -2.90%	Muni -0.03%
High Yield -2.22%	Muni -1.41%	Muni -0.94%	Muni -1.09%	Treasuries -3.87%	US Corp -1.76%	US Corp -1.79%	Muni -1.21%	US Corp -0.59%	Conservative -2.99%	Bar Agg -0.68%
Bar Agg -2.99%	Bar Agg -1.81%	Conservative -1.23%	US Corp -1.47%	Muni -8.32%	Muni -2.76%	High Yield -3.52%	US Corp -1.87%	High Yield -1.21%	High Yield -3.15%	US Corp -1.24%
60/40 -3.11%	60/40 -2.51%	Bar Agg -1.27%	Conservative -1.90%	US Corp -16.07%	High Yield -3.47%	Conservative -4.16%	Treasuries -3.82%	Muni -1.84%	60/40 -3.42%	Treasuries -1.86%
S&P 500 -3.31%	US Corp -2.59%	US Corp -1.73%	60/40 -2.36%	Conservative -21.41%	Conservative -6.53%	Muni -5.77%	Conservative -7.08%	Conservative -2.61%	Bar Agg -3.67%	Conservative -1.91%
Muni -3.71%	High Yield -3.77%	60/40 -2.00%	Treasuries -3.01%	60/40 -27.90%	Treasuries -12.92%	60/40 -7.14%	High Yield -7.46%	60/40 -5.62%	US Corp -4.98%	High Yield -2.10%
US Corp -3.79%	S&P 500 -4.00%	S&P 500 -2.88%	High Yield -4.77%	High Yield -32.48%	60/40 -13.39%	Treasuries -9.60%	60/40 -11.67%	Treasuries -5.80%	Muni -8.37%	60/40 -3.24%
Treasuries -6.07%	Treasuries -4.66%	Treasuries -5.49%	S&P 500 -4.85%	S&P 500 -37.66%	S&P 500 -18.18%	S&P 500 -12.80%	S&P 500 -16.26%	S&P 500 -6.60%	Treasuries -13.97%	S&P 500 -3.46%

Lower Drawdowns

Higher Drawdowns

Source: Zephyr, Redwood. YTD is from January 1, 2014 through November 30, 2014. Drawdowns are computed yearly (based on month end values), using 12 month moving windows, except for 2014, which is through November 30, 2014. High Yield is represented by the BofA Merrill Lynch US High Yield Index. Bar Agg is represented by the Barclays US Capital Aggregate Index. 60/40 is a blend of 60% MSCI ACWI and 40% Citi World Govt Bond Index. S&P500 is the S&P 500 Index. Muni is represented by BofA Merrill Lynch 12-22 Year US Municipal Index. US Corp is represented by BofA Merrill Lynch US Corporate Index. Treasuries is represented by the Barclays U.S. Treasury Long-Term Index. "Conservative" is represented by the Morningstar Conservative Allocation. Past performance not indicative of future results. Please see disclosures for more information.

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### INDICES AND FUNDS:

**The S&P 500 Total Return Index** is a stock market index, including dividends, based on the market capitalizations of 500 leading companies publicly traded in the U.S. stock market, as determined by Standard & Poor's. High-yielding corporate debt refers to debt that has been rated as "Non-Investment Grade" by rating agencies and has associated risks including, but not limited to, interest rate risk and credit risk. **The Barclay's US Aggregate Bond Index** consists of a composite of different securities to reflect weighted market capitalization of the aggregate bonds of each type traded in the U.S. including treasury, government, mortgage-backed, corporate, and foreign bonds. **The 60% MSCI ACWI (All Country World Index) and 40% Citi World Government Bond Index** is a 60%/40% blend of each index: the MSCI ACWI Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed and emerging markets; the Citi World Gov't Bond Index is a total-return index including sovereign bonds from developed and emerging markets. **The BofA ML (Merrill Lynch) US Corporate Index** tracks the performance of US dollar denominated investment grade rated corporate debt publicly issued in the US domestic market. **The BofA ML US High Yield Master II Index** is an index that consists of U.S. corporate debt that are non-investment grade to reflect the performance of U.S. dollar denominated non-investment grade debt. **The BofA ML 12-22 Year Municipal Securities Index** includes bonds in the National index that have an effective maturity that is greater than or equal to twelve years and less than twenty-two years. **The Barclay's US Treasuries: Long Index** includes all publicly issued, U.S. Treasury securities that have a remaining maturity of 10 or more years, are rated investment grade, and have \$250 million or more of outstanding face value.

UNLESS OTHERWISE NOTED, INDEX RETURNS REFLECT THE REINVESTMENT OF INCOME DIVIDENDS AND CAPITAL GAINS, IF ANY, BUT DO NOT REFLECT FEES, BROKERAGE COMMISSIONS OR OTHER EXPENSES OF INVESTING. INVESTORS CAN NOT MAKE DIRECT INVESTMENTS INTO ANY INDEX.

### FUNDS & ETF's

**THE VANGUARD MONEY MARKET FUND (VMFXX):** Invests in U.S. government securities and seeks to preserve shareholders' principal investment by maintaining a share price of \$1.

**SPDR S&P 500 ETF (SPY):** A basket of 500 stocks that are considered to be widely held. The investment seeks to provide investment results that, before expenses, generally correspond to the price and yield performance of the S&P 500 Index.

*Disclosures Continue on next page...*

## DISCLOSURES

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### DEFINITIONS:

Annualized Compounded Return – The year-over-year return of the stated time period.

Standard Deviation - Defined as a measure of dispersion of a set of data from its mean. Standard deviation is generally applied to the annual rate of return of an investment to measure the investment's volatility. This is calculated using monthly data within this deck.

Sharpe Ratio - Defined as the difference between an expected return subtracted by a minimum acceptable return, divided by the standard deviation. This is calculated using monthly data within this deck.

MAR - The Minimum Acceptable Return ("MAR") is defined as the minimum rate of return an investor is willing to accept. This is used in defining Sortino Ratio and downside deviation.

Omega – Compares upside gains against downside risk. Omega represents a scale of returns above a defined MAR.

Downside Deviation - Similar to standard deviation, except that downside deviation isolates only the negative returns that fall below a defined minimum acceptable return. This is calculated using monthly data within this deck.

Sortino Ratio - Defined as the difference between an expected return subtracted by a minimum acceptable return, divided by the downside deviation. This is calculated using monthly data within this deck.

Excess Return – A manager's returns that exceed a benchmark or relative index.

Up Capture – A measure of percentage of market gains captured by a manager when the relative market is up.

Down Capture – A measure of percentage of market losses sustained by a manager when the relative market is down.

Beta - A measure of a dependent variable's volatility or systematic risk relative to an independent variable (S&P 500 Index). Beta is the percent change in the price of the dependent variable given a 1% change in the independent variable. This reveals if the dependent variable moves in step with the independent variable; where a beta of 1 indicates perfect alignment.

Maximum Drawdown - Defined as a measure of peak to trough percentage loss in a given period. This is calculated using monthly data within this deck.

Pain Index - Defined as the mean value of the drawdowns over the entire analysis period.

Normal Distribution – A commonly occurring probability distribution often used in statistics.

Skew – Measures what degree a set of returns distribution is tilted (a normal distribution has a skew of 0).

Kurtosis – Measures the degree of peak of a returns distribution (a normal distribution has a kurtosis of 3; excess kurtosis of 0).

Calmar Ratio – Calculates the average annual rate of return divided by the maximum drawdown.

Regression – Statistical process for estimating a relationship among variables

Volatility - Used to describe uncertainty or risk in terms of statistical measure of dispersion (variation in prices).