

Educational Series

Common Metrics for Performance Evaluation: Overview of Popular Performance Measurement Ratios

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EVOLUTIQ GmbH is issuing a series of white papers on the subject of systematic trading. These papers discuss different approaches to systematic trading, present specific trading strategies and introduce associated risk management techniques.

This issue "**Overview of Popular Performance Measurement Ratios**" intends to provide the interested reader with an overview of popular ratios used to evaluate investment performance. We discuss five performance measurement ratios, which we consider the most common ones to measure performance in the alternative industry universe.

In this paper, we review five popular performance ratios: Calmar Ratio, Omega, Sharpe Ratio, Sortino Ratio and Treynor Ratio. We discuss each ratio as per the following subsections: history, basis, formula, strengths & weaknesses, boundary values of the function & improved variations of the ratio.

Calmar Ratio

History: Short for "California Managed Account Ratio", the Calmar ratio was introduced by Terry W. Young in 1991 in the Futures Magazine and is also referred to as the Drawdown Ratio (Young 1991).

Basis: The Calmar ratio is calculated as the average annual rate of return computed over the last thirty-six months, divided by the maximum drawdown in the same period. The calculation is computed on a monthly basis. The Calmar ratio is a risk-adjusted measure of performance as it measures return per unit of risk, with risk defined as the maximum drawdown. The Calmar ratio is a slightly modified version of the Sterling Ratio - average annual rate of return for the last thirty-six months divided by the maximum drawdown for the last thirty-six months. While the Calmar ratio is calculated on a monthly basis, the Sterling ratio is computed on a yearly basis.

Formula: For measuring the performance of a portfolio for a period of thirty-six months, the annualized Calmar ratio (Magdon-Ismael and Atiya 2015):

$$\text{Calmar Ratio} = \frac{\text{Return over } [0, T]}{\text{MDD over } [0, T]}$$

$$\text{Where } \text{MDD} = \max\left[\max\left(\sum_{t=0}^T R_t\right) - R_T\right]$$

MDD Denotes the maximum drawdown (the largest loss) realized over the period **T**, where **T** is a period of thirty-six months.

Decision Criteria: The higher the ratio, the better is the risk-adjusted performance of the investment strategy in the given time frame of three years.

Strengths of the Calmar Ratio:

- It provides a simple and meaningful metric to measure hedge fund & CTA performance.
- Since the Calmar ratio is calculated on a monthly basis, the ratio changes gradually and serves to smooth out the outliers of the performance more readily than either the Sterling or Sharpe ratios. Also, investors might prefer the maximum possible loss from peak to valley as the appropriate risk metric compared to other risk measures, such as volatility or VaR.
- Performance ratios, such as Sharpe and Sortino, which depend on volatility to measure risk are extremely sensitive in the short run; market instability can cause these ratios to vary significantly.
- The Calmar ratio with its three-year timeframe is inherently a more stable approach to evaluating investment performance.

Weakness of the Calmar Ratio:

- Calmar ratio defines risk as the maximum drawdown and ignores volatility as a risk component, thus measuring risk only from a drawdown perspective.
- The primary drawback from Calmar ratio is that the risk is defined by only a single event (the maximum drawdown) impeding their statistical significance and representativeness. Using the maximum drawdown as the only point estimate for risk could bias the performance assessment due to the presence of outliers.

The major drawback from Calmar ratio is that the risk is defined by only a single event, the maximum drawdown

- The Calmar ratio as a criterion for portfolio optimization is not widespread, primarily due to a lack of an analytical understanding regarding how the maximum drawdown of a portfolio is related to performance characteristics of the individual instruments (Magdon-Ismael and Atiya 2015).
- Not suitable for evaluating investment performance with a track-record less than three years.

Boundary Values of the Calmar Function

Calmar Ratio	Return	R.F	MDD.
$+\infty$	+ 1%	0%	0%
1	+1%	0%	+1%
0	+1%	+1%	+1%
-1	-1%	0%	+1%

Holding return & risk free constant. As MDD increases, Calmar Ratio decreases and vice-versa.

Calmar ratio is computed as a ratio of returns over the maximum drawdown. As MDD increases, Calmar ratio decreases and vice-versa.

MDD Sensitivity*

Calmar Ratio	$+\infty$	1	0.1	0
MDD.	0%	1%	10%	$+\infty$

*Holding Return & Risk Free Rate constant at 1% and 0%.

Improved Variations of the Calmar Ratio

Sterling-Calmar Ratio	(Kestner 1996)
Bruke Ratio	(Bruke 1994)
MAR Ratio	(Rose 1979)

Omega Ratio

History: Con Keating and William F. Shadwick observed that the assumption that the two first moments, mean and variance, to fully describe a distribution of returns causes inaccuracies in performance measurement (Keating and Shadwick 2002). The authors later introduced a performance measure called Omega that reflects all the statistical properties of the return distribution. Later investigations by Kazemi et al. (2004) showed that Omega is equal to the theoretical ratio of a call price to a put price.

Basis: Omega is a ratio of total probability weighted gains and losses for a given threshold. Omega represents a ratio of the cumulative probability of an investment's outcome above an investor's defined return level (a threshold level) to the cumulative probability of an investment's outcome below an investor's threshold level. It considers the returns below and above a particular loss threshold. Omega provides a ratio of total probability weighted losses and gains that fully describes the risk-reward properties of the underlying return distribution. The threshold level is typically defined as the minimum acceptable return (MAR) for an investor.

The principle of the measure consists in partitioning returns into losses and gains relative to the MAR of an investor, and then considering the probability weighted ratio of returns above and below the MAR while incorporating all of the higher moments of the return distribution.

Formula: For measuring the performance of a portfolio for a given period, the Omega is calculated as follows (Keating and Shadwick 2002):

$$\text{Omega} = \frac{\int_{r_d}^b 1 - F(r) f(r) dr}{\int_a^{r_d} F(r) f(r) dr}$$

Where F and f are the cumulative distribution and probability density function, respectively, of r (returns) and a and b set a relevant return interval over the time period of evaluation, given a threshold r_d (MAR). Omega is used as an ex-post performance measure, it is usually computed for a range of thresholds to evaluate performance.

Decision Criteria: The higher the ratio, the better the portfolio. A high Omega indicates that there is a higher density in the return distribution on the right side of the threshold (MAR) than on the left side.

Strengths of the Omega Ratio:

- The Omega ratio is a function of the return level and requires no parametric assumption on the distribution. In comparison with other ratios, such as Sharpe and Sortino, it does not depend on the normal distribution assumption.
- Omega accounts for higher distribution moments which is a more accurate approach to evaluating non-normality distributed returns. Omega incorporates all the moments of the distribution and that could bias the performance evaluations when returns are not normally distributed. For normally distributed returns, Omega provides additional information since it takes into account investor's specific preferences for MAR.
- A performance measure that captures the effects of all higher moments fully and which may be used to rank and evaluate manager performance.
- Omega is recommended for evaluating portfolios that do not exhibit normally distributed returns. Given financial securities exhibit asymmetrical

returns, Omega seems very suitable to evaluate results of all kind of financial strategies.

- Given the additional information it employs (the probability weighted measure), Omega is expected to produce different rankings of portfolios compared to those derived with other performance metrics.
- Keating and Shadwick (2002) argue that Omega could be used as a risk measure to construct a portfolio that does not reduce the volatility but reduces the extreme negative risk.

Weaknesses of the Omega Ratio:

- Assessing the risk-adjusted returns of a portfolio relying only on a single threshold could be misleading. Plotting Omega against different threshold values allows a more efficient assessment of investment attractiveness.
- Parametric approaches assume an underlying return distribution, whose parameters are estimated from historical data or calibrated to market prices. Non-parametric approaches forgo such assumptions and instead use the past observations as the underlying portfolio distribution. The measure provides less information on the distribution estimates and provides only a probability-based measure of the gain/loss scenario based on the investor's threshold.

Boundary Values of the Omega Function

Omega Ratio	Condition
Max	$(\Omega > 1 \text{ when } \text{MAR} < \mu)$
1	$(\Omega = 1, \text{ when } \text{MAR} = \mu)$
Min	$(\Omega = 0, \text{ when all returns } < \text{MAR})$

<i>Maximum Omega</i>	When MAR is lower than the mean of distribution μ , the Omega is higher than one ($\Omega > 1$ when $\text{MAR} < \mu$). The lower the MAR, the higher the probability to achieve it and thus the higher the Omega
<i>Omega at positive unity</i>	When the MAR is set to the mean of the distribution, the Omega ratio is equal to one ($\Omega = 1$, when $\text{MAR} = \mu$) ; The probability of returns above the MAR is equal to the probability of returns below the MAR
<i>Minimum Omega at zero</i>	The higher the MAR, the lower is the probability of achieving it, and therefore, an increasing MAR will lead the function to a value of zero.

Improved Variations of Omega

Sharpe-Omega

(Kazemi, Schneeweis and Gupta 2004)

Sharpe Ratio

History: In 1965, Nobel Laureate William F. Sharpe developed the Sharpe ratio as a method to measure the performance of mutual funds (Sharpe 1965). Sharpe originally called it the Reward-To-Variability Ratio that later came to be known as Sharpe ratio by academics and financial professionals. Mindful of the several limitations the ratio exhibits, Sharpe provided a review and restatement of the ratio's principle in 1994 (Sharpe 1994).

Basis: The Sharpe ratio measures the return earned in excess of the risk-free rate per unit of volatility or total risk of a trading strategy. It measures the return of a portfolio in excess of the risk-free rate, also called the risk premium, compared to the total risk of the portfolio, measured by its standard deviation. One of the most common variations on this measure involves replacing the risk-free asset with a benchmark portfolio. This variation is called the Information Ratio.

The Sharpe ratio uses the Capital Market Line as the risk-return referential, using the standard deviation of portfolio returns as the measure of risk.

Formula: For measuring the performance of a portfolio for a period of one year, the annualized Sharpe ratio is calculated as (Sharp 2013):

$$\text{Sharpe Ratio} = \frac{R_p - R_F}{\sigma(R_p)}$$

R_p : The annualized multi-period return over period T

R_F : The annualized base currency risk-free return over period T

$\sigma(R_p)$: The annualized volatility of the portfolio return over period T

Decision Criteria: The higher the ratio, the more attractive is the portfolio on a total risk-adjusted basis.

Strength of the Sharpe Ratio:

- Relative straightforwardness & simplicity as a measure to calculate aggregate performance. Standard deviation being the risk estimate includes systematic & unsystematic risk, which makes the Sharpe ratio suitable to evaluate portfolio returns that are not completely diversified. Also, it is useful to rank portfolios with different underlyings and trading strategies.

Weaknesses of the Sharpe Ratio:

- The Sharpe ratio penalizes upward and downward volatility equally. However, investors are more concerned with downward volatility. The removal of the highest returns from the distribution can increase the Sharpe ratio.
- Cvitanic, Lazrak and Wang (2007) show that the typical mean-variance efficiency justification to use the Sharpe ratio, valid in a one-period setting, typically fails in a multi-period setting.
- For the standard deviation to be an unbiased estimator in measuring volatility, it must be generated from a process that is both stationary and parametric. This implies that each daily change in a time series is produced by a process with broadly constant statistical characteristics (variance, skew and kurtosis). Empirical evidence shows that return distributions exhibit jumps, are skewed to the left, have higher peaks and heavier tails than those of the normal distribution. Such non-normal

The removal of the highest returns from the distribution can increase the Sharpe ratio

distributions exhibit skewness and kurtosis and produce biased estimates of standard deviation.

- The Sharpe ratio use statistics based on the underlying assumption that the reported returns are independent and identically distributed.
- The Sharpe ratio and Information ratio, two performance indicators often used to rank mutual funds, may lead to spurious ranking when fund excess returns are negative.
- Unless the investor's investment horizon exactly matches the performance measurement period of the portfolio manager, the portfolio with the highest Sharpe ratio is not necessarily the most desirable from the investor's point of view.

Boundary Values of the Sharpe Function

Sharpe Ratio	Return	R.F	Std.
$+\infty$	+ 1%	0%	0%
1	+1%	0%	+1%
0	+1%	+1%	+1%
-1	-1%	0%	+1%
$-\infty$	- 1%	0%	0%

Sharpe approaches infinity since active return is positive and standard deviation of returns is zero or close to zero

Maximum Sharpe at positive infinity

In the case of a standalone investment in a positive interest bearing account. Given the guaranteed return of the deposit account, the standard deviation is zero. Therefore, the Sharpe ratio approaches infinity since active returns are positive and standard deviation of returns is zero

Sharpe at positive unity

Sharpe ratio approaches unity when the ratio of active returns over standard deviation is equal to one

Sharpe at zero

In the case of an investment strategy with zero active returns in the numerator (Portfolio Returns – Risk Free Rate) the ratio is equal to zero

Sharpe at negative unity

In the case of an investment strategy with negative returns, the active returns (numerator) is negative, resulting in a negative Sharpe ratio

Minimum Sharpe at negative infinity

In the case of a standalone investment in a negative interest bearing account. Given, the guaranteed return of the deposit account, the standard deviation is zero. Therefore, the Sharpe ratio approaches negative infinity since active return is negative and standard deviation is zero or close to zero

Improved Variations of Sharpe Ratio

Information Ratio	(Sharpe 1994)
Deflated Sharpe Ratio	(Bailey and Prado 2014)
M2 Measure	(Modigliani and Modigliani 1997)
Generalized Sharpe Ratio	(Dowd 2000)
Double Sharpe Ratio	(Vinod and Morey 2001)

Sortino Ratio

Sortino Ratio recognizes that investors prefer upside risk rather than downside risk and utilizes semi-standard deviation as the risk estimator

History: In the early 1980s, Dr. Frank Sortino of the Pension Research Institute, had undertaken research to come up with an improved measure of risk-adjusted returns. The Sortino ratio is part of an extended family of risk-adjusted measures that was created in the realizations that large positive performance deviations should not be penalized in the same manner as large negative performance deviations and that failing to earn the mean return is not how most investors define risk. In the early 1990s, Sortino & Van der Meer (1991) considered the failings of the Sharpe ratio and introduced a risk-adjusted performance measure, which came to be known as the Sortino Ratio.

Basis: The Sortino ratio is a modification of the Sharpe ratio, it is defined on the same principle as the Sharpe ratio. However, the risk-free rate is replaced with the minimum acceptable return (MAR), the return below which the investor does not wish to drop, and the standard deviation of the returns is replaced with the standard deviation of the returns that are below the MAR. Sortino ratio recognizes that investors prefer upside risk rather than downside risk and utilizes semi-standard deviation. Semi-standard deviation measures the variability of underperformance below a minimum target rate. All positive returns are included as zero in the calculation of semi-standard deviation or downside risk.

Formula: For measuring the performance of a portfolio for a period of one year, the annualized Sortino ratio (Sharp 2013) is defined as follows:

$$\text{Sortino Ratio} = \frac{R_p - T_A}{DR\sqrt{T}}$$

R_p : Annualized multi-period return over period T

T_A : Multi-period target rate of return for the investment strategy under consideration over period T

$DR\sqrt{T}$: Where DR is the target semi-deviation or downside risk that measures the variability of returns below a minimum target rate. T is the number of single observations in the reporting period.

$$DR = \left(\sum_{t=1}^T \frac{\min[(R_t^p - T_{A,t}, 0]^2}{T - 1} \right)^{1/2}$$

Decision Criteria: The Sortino ratio is intended to be used in a relative context to compare a portfolio or fund with another fund or a benchmark index. A higher Sortino ratio indicates better risk-adjusted performance. To rank performance of funds, the Sortino ratio of each fund must use the same MAR.

Strengths of the Sortino Ratio:

- The Sortino ratio appears to resolve several of the issues inherent in the Sharpe ratio: It incorporates a relevant return target, in both the numerator and the denominator; it quantifies downside volatility without penalizing upside volatility. Because of its focus on downside risk, it is also more applicable to distributions that are negatively skewed in comparison with measures based on standard deviation.
- Risk being defined only by downside risk, portfolio managers will not be penalized for upside variability but only for variability below the minimum target return.

- Comparing the Sharpe ratio and the Sortino ratio for a fund can give an indication of what portion of a fund's volatility is related to outperformance versus underperformance.
- The Sortino ratio was introduced by Sortino and Price (1994) and Pedersen and Satchell (2002) proved that the risk/return frontier, when risk is defined by standard deviation, exhibits the same desirable convexity properties of the traditional mean-variance frontier, thus rendering it applicable for portfolio analytics.

Weaknesses of the Sortino Ratio:

- The Sortino ratio only incorporates downside volatility below the threshold and ignores upside volatility, thus describing the risk variable only as the downside volatility and thus providing an incomplete perspective on the risk variable.
- The Sortino ratio uses an investor-defined target return for the benchmark, therefore this ratio is not as widely reported as other ex-post risk-adjusted performance measures.
- When portfolios returns are not normally distributed, higher moments such as skewness and kurtosis need to be considered to adjust for non-normality and to account for the failure of variance to measure risk accurately.
- The different approaches for the calculation of downside deviation can have a considerable impact in the ratio's output. Sortino and Forsey (1996) warn that the proper calculation of downside deviation is quite complex and that the widespread method of simply using the historical returns that fall below the MAR can significantly underestimate downside risk.
- Applying the Sortino ratio to strategies with known asymmetric return distributions, such as hedge funds, could be misleading. Lo (2002) observed exaggerated Sharpe ratios among hedge funds stemming from serial correlation in the monthly returns.
- Computing downside deviations and annualized returns from discrete data leads to inaccurate estimates. For the most precise measurement, Sortino and Forsey (1996) recommend fitting a continuous curve to a bootstrapped distribution and using integral calculus to make the calculation. The continuous methods for calculating downside deviation incorporate a forward-looking element into the measure, as opposed to providing an estimate of risk based on an incomplete series of historical returns.

Boundary Values of the Sortino Function

Sortino Ratio	Return	MAR	DR.
$+\infty$	+ 1%	0%	0%
1	+1%	0%	+1%
0	+1%	+1%	+1%
-1	-1%	0%	+1%
$-\infty$	- 1%	0%	0%

Applying Sortino ratio to strategies with known asymmetric return distributions, such as hedge funds could be misleading

<i>Maximum Sortino at positive infinity</i>	In the case of a standalone investment in interest bearing account. Given, the guaranteed return of the deposit account, the standard deviation is zero or close to zero. Sortino approaches infinity since active return is positive and standard deviation is zero or close to zero
<i>Sortino at positive unity</i>	Sortino approaches unity when the ratio of active return over standard deviation is equal to one
<i>Sortino at zero</i>	In the case of an investment strategy with zero active returns in the numerator (portfolio returns – risk free rate) the ratio is equal to zero
<i>Sortino at negative unity</i>	In the case of an investment strategy with negative returns, the active returns (numerator) are negative, resulting in a negative Sharpe ratio
<i>Minimum Sortino at negative infinity</i>	In the case of a standalone investment in a negative interest bearing account. Given, the guaranteed return of the deposit account, the standard deviation is zero. Sortino approaches negative infinity since active return is negative and standard deviation is zero

Improved Variations of Sortino Ratio

Fouse Index	(Sortino and Price 1994)
Upside Potential Ratio	(Sortino, van der Meer and Plantinga 1999)
Variability Skewness	(Bacon 2008)
Sortino-Satchell Ratio	(Sortino and Satchell 2001)
Kappa	(Kaplan and Knowles 2004)

Treynor Ratio

History The Treynor Ratio was devised by Jack L. Treynor in 1965, and is also called the Reward-to-Volatility Ratio or Treynor Measure (Treynor 1965). The ratio was an innovative concept in measuring performance since it was the first metric to measure portfolio performance while deducing the market component. In 1973, Treynor and Fisher Black introduced the Appraisal Ratio as an alteration of the original version Treynor Ratio.

Basis: The Treynor ratio is a risk-adjusted performance measure that isolates the portion of a portfolio's return explained by its sensitivity to market risk. The Treynor ratio is a measurement of return earned in excess of that which could have been earned on an investment that has no diversifiable risk per unit of market risk assumed. Hence, it is determined as the portfolio return in excess of the risk-free rate of return per unit of systematic risk.

The Treynor and Black (1973) Appraisal ratio use the Capital Market Line (CML) as the risk-return referential, using standard deviation of portfolio returns as the measure of risk. The Treynor ratio directly relates to the beta of the portfolio using the Security Market Line (SML).

Formula: For measuring the performance of a portfolio for a period of one year, the annualized Treynor ratio is calculated as (Sharp 2013):

$$\text{Treynor Ratio} = \frac{R_p - R_F}{\beta(R_p, R_B)}$$

R_p : The annualized multi-period return over period T

R_F : The annualized base currency risk-free return over period T

$\beta(R_p, R_B)$: Beta of return R_p portfolio return relative to benchmark return R_B

Decision Criteria: The higher ratio, the more attractive is the portfolio on a relative risk-adjusted basis.

Strength of the Treynor Ratio:

- The Treynor ratio distinguishes between systematic and unsystematic risk.
- Portfolio betas are inherently more stable than portfolio standard deviation but are subject to change as underlying betas and co-variances evolve over time. Measuring the R^2 of the portfolio beta can provide an indication of whether the degree of correlation between the market index and the portfolio is significant.
- The Treynor ratio could be used as a metric to evaluate a portfolio's performance relevant to the degree of market risk undertaken by the manager.

Weakness of the Treynor Ratio:

- The ranking of portfolios using Treynor ratio is suitable only if the portfolios under consideration are sub-portfolios of a broader, fully diversified portfolio.
- Subject to generic weaknesses of Capital Asset Pricing Model (CAPM), according to the CAPM, the expected return of an asset depends on two factors: the risk-free rate and the market risk premium, measured by beta.
- The ratio assumes that the portfolio under study is fully diversified. Hence, only systematic risk is taken into account, measuring market risk only, not total risk, and is sensitive to the choice of market index.

Portfolio betas are inherently more stable than portfolio standard deviation

- The model's mean-variance assumption limits the application of Treynor ratio as a performance metric to strategies that are expected to have only normally distributed returns; they are not useful for asymmetrical return strategies which most financial securities exhibit.

Boundary Values of the Treynor Function

Treynor Ratio	Return	R.F	β
$+\infty$	+ 1%	0%	~ 0
1	+1%	0%	1
0	+1%	+1%	1
-1	-1%	0%	1
$-\infty$	- 1%	0%	~ 0

A beta of zero does not signify a lack of volatility relative to the market but rather a lack of correlation with market volatility

Maximum Treynor at positive infinity

An investment strategy with a low correlation with its benchmark index would yield a beta close to zero. The lower the beta, the correlation with the benchmark, the higher the Treynor ratio and vice-versa

Treynor at positive unity

A beta coefficient of one indicates that the portfolio's returns vary around the portfolio's mean to the same magnitude and in the same direction as the benchmark returns vary around the benchmark mean; it does not mean that the portfolio will have the same returns as the benchmark

Treynor at zero

An investment strategy with zero active returns will result in a Treynor ratio value of zero

Treynor at negative unity

An investment strategy with negative active returns will result in a negative Treynor ratio given the beta coefficient is bounded by a positive range [0,1]

Minimum Treynor at negative infinity

An investment strategy with negative returns and very low correlation with the benchmark return will result in a beta coefficient close to zero and a large negative Treynor ratio

Improved Variations of Treynor Ratio

Appraisal Ratio

(Treynor and Black 1973)

Jensen Alpha

(Jensen 1968)

Generalized Treynor

(Hübner 2003)



Dr. Oliver Steinki, CFA, FRM
CEO & Co-Founder of EVOLUTIQ

Responsible for the entrepreneurial success of EVOLUTIQ. He combines his expertise in statistical learning techniques, ensemble methods and quantitative trading strategies with his fundamental research skills to maximize investment profitability.

Oliver started working in the financial industry in 2003. Previous roles include multi-asset-class derivatives trading at Stigma Partners, a systematic global macro house in Geneva, research at MSCI (Morgan Stanley Capital Intl.) and corporate banking with Commerzbank. From an entrepreneurial perspective, Oliver has co-founded and invested in several successful start-ups in Switzerland, Germany and the UK. Some of these startups received awards from the FT Germany, McKinsey, Ernst & Young and the German federal ministry of economics. Oliver is also an adjunct professor teaching algorithmic trading and portfolio management courses at IE Business School in Madrid and on the Hong Kong campus of Manchester Business School.

Oliver completed his doctoral degree in financial mathematics at the University of Manchester and graduated as a top 3 student from the Master in Financial Management at IE Business School in Madrid. His doctoral research investigated ensemble methods to improve the performance of derivatives pricing models based on Lévy processes. Oliver is also a CFA and FRM charter holder



Ziad Mohammad
Sales & Research Analyst

As part of his role, Ziad splits his time between the research and sales departments. On one hand, he focuses on researching fundamental market strategies and portfolio optimization techniques. On the other hand, he participates in the fundraising & marketing efforts for EVOLUTIQ's recently launched multi asset class strategy.

In his past role as a 'Financial Analyst' at McKinsey & Company, he applied statistical and data mining techniques on data pools to extract intelligence to aid in the decision making process.

Ziad recently completed his Masters degree in Advanced Finance from IE Business School, where he focused his research on emerging markets and wrote his master's final thesis focusing on bubble formations in frontier markets. He completed his bachelors degree in Industrial Engineering from Purdue University and a diploma in Investment Banking from the Swiss Finance Academy.

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