Return Parity™ Approach

Abstract

In this paper we propose a new approach to financial market investment that we call Return Parity™, in which assets are allocated to provide investors an expected return determined ex-ante and obtained with the use of a quantitative model.
The innovation of the approach lies in shifting attention from the aspect of risk to the aspect of return, and in inverting the causal link between the two variables.
In this study, we will propose a quantitative strategy developed expressly for the purpose and then verify whether such strategy is capable of ensuring the investor a more constant return over time.
Many quantitative and discretional strategies are coherent with a Return Parity™ approach.
It is our hope that both academics and practitioners alike adopt this approach in structuring their quantitative models with the objective of making the expected returns from investment products constantly more operational and reliable.

Keywords: Mean absolute deviation, target return, portfolio selection, return parity, Diaman ratio, martin ratio, ulcer index, absolute return.

1. The essential features of the Return Parity approach

1.1 Starting conditions

Whenever we analyze financial portfolios with varying risk levels, we always remember the reassuring (at least in theory) conclusion that the portfolio with the highest risk must necessarily have the highest expected return.

This idea is so deeply rooted that after conducting in-depth studies, the CESR (now known as the ESMA) has constructed a Synthetic Risk Reward Indicator (Ref.: CESR/09-1026) for UCITS mutual funds based exclusively on volatility.

The message sent to investors is obvious: choosing a fund with the highest risk "typically" (quoting directly from the document) leads to the highest expected return.

This method ignores the task of estimating the expected return, for which historical measurement would surely be the wrong approach, and focuses instead on the calculation of an historical risk indicator, giving investors the idea that the expected (or target) return is strictly linked to the level of risk assumed.

But what exactly is risk? Regardless of the way in which it is measured, risk is the (very real) possibility that the return will be different than expected. If the expected return is not quantified ex ante however, it will be hard for the investor - through the data derived from real experience in investing - to estimate the parameters of the theoretical function that links the risk assumed (an independent variable) with the return obtained (a dependent variable).

Estimating empirically (on the basis of experience) the function that links the risk assumed ex ante with the return expected ex ante and with the return obtained ex post runs up against a clearly evident obstacle: the risk of the various assets classes (in other words, the various "markets") is not constant but instead oscillates widely over time. Is it wise to assume that in the moments of high volatility the expected return (not quantified) will be higher and in the moments of lower volatility, the expected return (not quantified) will be lower?

As is widely known, in practice, the risk/return ratio nearly becomes something merely taken for granted: stocks have a higher expected return than bonds; corporate bonds have higher expected returns than government bonds, and so on, following a building block approach for risk premiums (Ibbotson, Stocks, Bonds, Bills and Inflation). The attention is focused on the long-term expected returns (without quantifying the timeframe precisely), which will eventually be obtained with patience. The mean and variance (and correlation) of the probability distribution of "strategic" asset classes in the short-term must be hypothesized as "fairly stable". The strategic asset classes are those asset classes whose probability distribution may be considered known (and stable).

However, the central limit theorem helps "smoothing" unstable probability distribution forecast peaks. In the long-term, the relationship between volatility and return is known, or at least believed to be known.

This observation is of scarce practical use, however, when investments decisions must be made for complex portfolios that invest in "markets" with little or no history characterized by strong specific components (or unexplored systematic risks). Volatility reacts very

quickly to changes in scenario, and in the short-term, risk and return can be easily confused.
It is therefore extremely difficult, once the portfolio's risk has been calculated (a relatively simple operation), to give a practical reply to the investor's equally simple question: how much is the expected return?
Well-known behavioral factors make it highly improbable for the investor to obtain the promised expected return, however. In short, even if a stable long-term relationship between risk and return were to be found, the behavioral bias that has been amply demonstrated would radically compromise concrete investment/disinvestment choices, effectively inverting the sign: the more volatile markets are those where mistakes are more easily made.
Risk control therefore seems to become relevant. If the portfolio's risk level is kept within the limits tolerable for the investor, behavioral errors are reduced and greater stability in the risk/return ratio can be obtained. Risk is the independent variable; return in the dependent variable. Keeping the risk and its variability under control will prevent the investor from making mistakes.
Strategies referred to as Risk Parity must be interpreted in this light. Given a particular risk budget, it is allocated in inverse proportion to the risk of each asset class by following (contrarian risk following) the evolution of the risk level of the investments.
These strategies are believed to generate ex post value, but not necessarily ex ante value, even if the general risk/return relationship prevails in the long-term. In the long-term and in traditional asset classes (those "predictable"), risk control is pointless: periods of high volatility will be followed by periods of lower volatility, and the mean is fairly stable. Why reduce the weight of the asset that proves to be pro tempore riskier and increase the weight of the one that appears less risky? The answer is easy: if losses count twice as much as gains in accordance with prospect theory, limiting portfolio drawdown heightens the value perceived by the investor and limits behavioral mistakes.
Interesting. However, this brings us back to our first question: what is the expected return of a Risk Parity strategy? The most reassuring answer we can give investors is that a risk parity portfolio will be more efficient than a Buy and Hold portfolio or a constant mix portfolio. The truth is, we do not know the answer, and only that "we will find out as we go along".

1.2. The new approach

The approach we propose in this paper envisions radically shifting the attention from the portfolio's risk to the portfolio's return, and this is figuratively a gauntlet thrown before the industry. The portfolio's risk is more easily measurable but has less value in the eyes of the investor; the portfolio's expected return is exceedingly hard to quantify, but is unquestionably what counts most in the choices the investor makes.
In our opinion, the downside to the financial industry's dedication of so much attention on risk control in recent years is the emphasis is has placed on a short-term view, its confusion of volatility with return, and exaggerates the importance of capital losses that are destined to be recovered in the normal turn of events anyway. Above all, it "de- responsibilizes" the

industry. Is risk control our mission? No, and it is entirely clear that the generation of return is the mission that the investor assumes the industry has posed.
An awareness of the portfolio's expected return permits precise choices to be made while adopting as reference the level of risk that must necessarily be assumed to achieve such return. This aspect becomes very clear when observing an "efficient frontier" that lets us start from the return in order to find the risk necessary to obtain it. But the "efficient frontier" is based on long-term relationships that can be clamorously denied in the short-term (albeit not necessarily in the very short-term).
The approach referred as to Return Parity inverts the causal link between return and risk: the former is the independent variable; the latter is the dependent variable.
The return to be realized must be defined ex ante. The necessary risk to obtain it by investing in financial markets will vary in time. The investment manager's mission is to obtain the expected return through a management strategy capable of interpreting market performance correctly.
In theory, with the use of the right strategy, any market can generate the return decided. The market exposure must be appropriately varied in regard to the ratio between the return expected from the market and the expected return for the investor. If the emerging stock market has an expected return of 20% in the next three months and the investor has decided on a 5% annual return, it is easy to calculate the exposure necessary for coherence with the objective.
Return Parity research consists in generating the same expected return regardless of the investment market. In a hypothetical asset allocation, asset classes with higher expected returns will be weighted lower, whereas asset classes that have lower expected returns will be given higher weight.
Return Parity strategy therefore requires the identification of the investment markets and model (or different models for each "market") that permits an expected short return to be assigned to each asset class. On the basis of the return budget to be obtained, portfolio allocation can be equally weighted, considering that the exposure in each asset class will determine the same expected return, the target return, for all.
It must be clear that the Return Parity approach does not assign an explicit role to portfolio risk, and that it is merely the pro tempore risk required to achieve the desired return.
We are perfectly aware that in a world of RAF, VaR, cVaR, CET1, and assorted capital absorption calculations, this is a revolutionary approach in terms of some of its aspects. This world of risk is the world that the financial industry has created in its own image and resemblance. It is not the world of the investor (private or institutional). In this world, the closing of the financial year (or quarter) bears no great significance, but the achievement of life goals or the respect of institutional responsibility is instead vital, with little or no regard for the trends in financial markets.

2. Risk Parity and Return parity

Over the last 15 years, many fund managers have proposed various Absolute Return strategies having as reference benchmarks the Euribor plus a percentage that varied more or less on the basis of the fund's risk level, but the choice of a higher reference target was – nearly always – readily justified by a different exposure to equity markets, while a quantitative model that permitted to aim at such return effectively and constantly was hardly ever provided.

In 2008 and 2011, many of these funds encountered difficulties because the correlation between the asset classes came close to 1 during market downturn phases, effectively preventing fund managers from obtaining positive returns other than by using derivatives that enabled them to short the market.

In these years, in the wake of two white papers by Qian: Risk Parity portfolios; *Efficient Portfolios through True Diversification* (2005) and *Risk parity Portfolios: the next generation* (2009), various strategies were developed with constant risk management maintenance logic in every financial market phase, in other words, those in which the exposure of the assets with the highest risk levels varied in time in order to keep the ex-ante risk constant.

As shown in the paper *Risk Parity Portfolio vs. Other Asset Allocation Heuristic Portfolios* by D. Chaves (2011), although these asset allocation strategies are clearly better than minimum variance strategies and mean-variance efficient portfolio strategies, they cannot consistently better a portfolio that is structured 60/40 in equity/Bond, even from a risk-adjusted point of view.

If Risk Parity logic helps the intermediary provide his or her investors with asset allocation that attempts to maintain the client's existing risk profile and therefore avoid subjecting the latter to higher risks than those he or she is willing to run, one on hand, the clients themselves have grown accustomed over the years to a known return typical of bank or government bonds, which following the negative interest rates in Europe and the very low rates prevailing in nearly the rest of the entire world today are no longer obtainable, on the other .

Furthermore, the financial intermediary's typical customer who buys bonds has realized that also corporate bonds (in 2008) and government bonds (in 2011) fluctuate widely and can even jeopardize the entire capital invested.

In this paper, we propose shifting attention to the expected return of a financial instrument and will propose a Long Only and Long/Short strategy for use in the equity markets, and then we will modify it with Return Parity logic to verify if and how the distribution of the returns can be modified to better suit the investor's needs.

3. The Diaman Ratio for Trend Estimation

Beginning with Merton's "On Estimating the Expected Return on the Market: An Exploratory Investigation" written in 1980, many different paths have been taken in the attempt to create expected return estimate indicators that provided investors with concrete values.

Given that this is an extremely difficult task, we had proposed our own solution in the paper entitled *DIAMAN RATIO* (2011), from which we provide the following excerpts:

Let's suppose $\mathrm{P} = (p_1, p_2, p_3, \dots, p_n)$ *the historic series of weekly logarithmic prices of a financial instrument and* $t = (0, {}^{1}/_{f}, {}^{2}/_{f}, \dots, {}^{(n-1)}/_{f})$

the historic series of time where f= 52 e n is the length of the historic series.

The Diaman Ratio is calculated as follows:

$$DR = \beta \cdot R^2$$

Where:

β *is the estimated coefficient of the linear regression model* $P_i = \beta \cdot t_i + \alpha + \varepsilon_i$

R^2 *is the linear determination coefficient.*

The use of the logarithmic historic series is important for a more accurate calculation, since the logarithm acts on the variability of the series and manages the scale effect which is instead shown by linear series.

The estimated β *is nothing but the annual logarithm growth rate of the historic series. To obtain the linear growth rate, calculate* $e^{\beta} - 1$. *This is even truer for the extreme case of a historic series growing at constant rate. Indeed, if we calculate the* β *of the historic series with these characteristics, the beta value will be equal to the growth rate value.*

For this reason, if the estimate of the future returns of a historic series of a stock market is negative, then common sense allows us to say that investing in such market will not be advantageous until the expected return becomes positive.
As we showed in our 2011 paper, and also with the use of financial instruments in the real world, the timing generated by the use of the Diaman ratio brings undeniable advantages in terms of risk-adjusted performance also in the long-term.

4. Statistical indicators for case studies analysis

For the analysis of the examples provided in this paper, we have taken the following statistical indicators into consideration:

Annual return

Mean annual return is an informational indicator regarding the average gain of a determined portfolio/fund in a determined period (year).

It is calculated as:

$$R_m = \left(\frac{P_f}{P_i}\right) \exp\left(\frac{12}{N}\right) - 1$$

where

$P_f = \ final\ value$

$P_i = \ initial\ value$

$N = number\ of\ months$

Volatility

Standard deviation (or volatility) is an indicator of the percentage variation of prices averaged over time. This indicator uses the historic series of prices.

The mathematical formula is as follows:

$$\sigma = \sqrt{\frac{\sum_{i=1}^{N}(x_i - \bar{x})^2}{N}}$$

where:

x_i= asset return at time *i*

$\bar{x}$ = average returns

N = number of months

Max Drawdown

This is financial instrument risk indicator represents the maximum loss matured during the period of analysis compared to the maximum peak value recorded previously.

The mathematical formula is as follows:

$$MaxDD(T) = \max_{\tau \epsilon (0,T)} \left[\max_{t \epsilon (0,\tau)} X(t) - X(\tau) \right]$$

Ulcer Index

The ulcer index is an indicator invented by Peter Martin in 1987 published in the book entitled "The Investor's Guide to Fidelity Funds".

This indicator establishes a relationship between the losses for the period and the time required for their recovery, and calculates the amount of drawdown or retracement occurring over a period.

The mathematical formula is as follows:

$$R_i = 100 * \frac{price_i - \max{(price)}}{\max{(price)}}$$

$$UI = \sqrt{\frac{R_1^2 + R_2^2 + \cdots R_N^2}{N}}$$

Where R_i is the retracement of the historical series from its previous peak.

Martin Ratio

The Martin ratio is un indicator that calculates the ratio between a portfolio's extra return compared to the risk free rate and the Ulcer index (UI).

The mathematical formula is as follows:

$$MR = \frac{r_p - r_f}{UI}$$

where:

r_p = is the portfolio's return

r_f = risk free rate

Sharpe Ratio

The Sharpe ratio is an indicator that calculates the ratio between a portfolio's extra return compared to the risk free rate and volatility.

The mathematical formula is as follows:

$$SR = \frac{r_{\mathrm{p}} - \mathrm{r_f}}{\sigma_p}$$

where:

r_p = is the portfolio's return

r_f = risk free rate (in this paper, taken as 0)

σ_p= standard deviation (or volatility)

The Diaman Ratio

The DIAMAN Ratio is a useful indicator in measuring correct performance for the risk in question, and is proposed as an alternative instrument to the mean variance approach, given the latter's limits in regard to fund selection.
The Diaman Ratio can be interpreted as an indicator of the persistency of returns that analyzes the strength of the trend (expected return) and the capacity of the financial instrument to vary around its own trend (risk).
The DIAMAN Ratio takes into account the sequentiality of returns over time and is based on a definition of the risk that is coherent with a number of consolidated results of behavioral finance.
Hypothesizing $P = (p_1, .. p_n)$ as the historic series of weekly logarithmic prices of a financial instrument and t= $(0, \frac{1}{f}, .. \frac{n-1}{f})$ as the historic series of time where f = 52 is the length of the historic series.

The mathematical formula is as follows:

$$DR = \beta * R^2$$

where

β is the estimated coefficient of the linear regression model: $P_i = \beta * t_i + \alpha + \varepsilon_i$

R^2 is the linear determination coefficient associated with the regression.

4. Case study no. 1: the use of Diaman Ratio for indexes timing

Supposing the purchase or sale of a stock market index to be in some way replicable, we have imagined the replication of the MSCI World Index with the four indexes below:

	Weight Buy & Hold Strategy	Weight Long Only Strategy	Weight Long/Short Strategy
MSCI USA	60%	0% to 60%	-60% to 60%
MSCI EUROPE	25%	0% to 25%	-25% to 25%
MSCI JAPAN	9%	0% to 9%	-9% to 9%
MSCI ASIA	6%	0% to 6%	-6% to 6%

Although the four indexes weighted as follows are a simplification of the MSCI World Index, they permit the testing of a Return Parity™ strategy with minimum diversification. The reader can easily understand that decidedly better results can be obtained by applying this strategy to a more complex assortment of financial instruments.

We hypothesize three investors using a different strategy each in the same equity markets represented by the four indexes described above.
Investor 1 adopts classic Buy & Hold strategy, making his investment at the start of the period, January 2002, and then forgetting about it until June 2016
Investor 2 applies 0/100 strategy by following the monthly indications obtained by the DIAMAN Ratio and the rule: IN, if DR>-0.01 and OUT, if DR<-0.01.
Investor 3 uses Long/Short strategy by following the monthly indications obtained by the DIAMAN Ratio and the rule: Long, if DR>-0.01 and Short, if DR<-0.01.
These three investors do not apply any form of Return Parity™ logic but instead adopt fixed leverage equal to 1, therefore resulting in Investor 1 investing 100%, Investor 2 either 0% or 100%, and Investor 3 100% or -100%.
All the investors have an annual 2% management cost and a 0.10% negotiation cost.

The results obtained by these investors are summarized in the table below:

	INV1	INV2	INV3
Annual return	3.6%	5.0%	7.1%
Volatility	14.4%	9.4%	10.4%
Max Drawdown	-53.8%	-19.9%	-18.8%

Ulcer Index	0.19	0.08	0.06
Martin Ratio	0.18	0.60	1.11
Sharpe Ratio*	0.25	0.53	0.68
Diaman Ratio	2.1%	5.5%	5.7%

* Risk Free Rate 0%

5. Case Study no. 2: the use of leverage to obtain the Expected Return

Having established that we have found a sufficiently efficient indexes timing method, let us now imagine that our investor wants to obtain a specific expected return determined ex-ante and that it is possible to determine (ex-ante) the long-term result that will be given by equity markets.
If Investor 1 had desired to obtain the mean annual return desired by Investor 2 or even Investor 3, which type of leverage would he have been required to adopt?

	Lev. 1	Lev. 1.5	Lev. 2	Lev. 2.5	Lev. 3	Lev. 3.5	Lev. 4
Mean Annual Return	3.6%	4.5%	4.9%	4.6%	3.6%	1.8%	-0.9%
Standard Deviation	14.4%	21.6%	28.8%	35.9%	43.1%	50.3%	57.5%
Max Drawdown	-53.8%	-69.7%	-80.8%	-88.2%	-93.1%	-96.1%	-98.0%
Ulcer Index	0.19	0.28	0.37	0.45	0.53	0.60	0.68
Martin Ratio	0.18	0.16	0.13	0.10	0.07	0.03	- 0.01
Sharpe Ratio*	0.25	0.21	0.17	0.13	0.08	0.04	- 0.02
Diaman Ratio	2.1%	2.2%	1.8%	1.1%	0.5%	0.1%	0.0%

* Risk Free Rate 0%

From this example it is clear that the use of the leverage does not permit the achievement of satisfying results in the events of elevated drawdown, and for this reason with a Buy & Hold approach it is not possible for Investor 1 to achieve the results obtained by Investors 2 and 3 in either terms of absolute performance or much less, risk/return terms.
The case is different for Investor 2, because the fact that he can rely on a risk control technique - and especially – a drawdown control technique, allows him to use leverage better and thus obtain better results. Clearly, after an initial improvement, performance indicators tend to worsen because leverage inevitably leads to a heightening of the risk indicators.

	Lev. 1	Lev. 1,5	Lev. 2	Lev. 2,5	Lev. 3	Lev. 3,5	Lev. 4
Realized Annual Return	3.6%	7.3%	9.3%	11.2%	12.8%	14.1%	15.1%
Standard Deviation	14.4%	14.2%	18.9%	23.6%	28.3%	33.0%	37.8%
Max Drawdown	-53.8%	-28.7%	-36.9%	-44.3%	-51.2%	-57.4%	-63.0%
Ulcer Index	0.19	0.12	0.16	0.20	0.23	0.27	0.30
Martin Ratio	0.18	0.59	0.58	0.56	0.54	0.52	0.50

Sharpe Ratio*	0.25	0.52	0.50	0.47	0.45	0.43	0.40
Diaman Ratio	2.1%	7.7%	9.8%	11.7%	13.2%	14.5%	15.4%

* Risk Free Rate 0%

These results show that if Investor 2, who wants to obtain with the use of 0/100 strategy the same results as those achieved by Investor 3, who invests using Long/Short strategy, then Investor 2 must use Lever 2; this triggers a considerable increase in both volatility and drawdown, and confirms that while the use of leverage may enable the achievement of the desired returns, it is not an improved approach for the investor.

6. The Diaman Ratio for the Return Parity™ Approach

As described in our original paper, the Diaman ratio is an estimating tool for expected results based on past trends.
It is obviously all the more realistic to the extent that the coefficient of determination R^2 tends towards 1 and the extent to which this trend is persistent.
In the previous chapter, we used the Diaman ratio to define a stock market In-Out model; we will now apply it to estimate the return realized by the equity line derived from In-Out signals.
This will allow us (hypothetically) to adjust the portion of the portfolio ω_t allocated in that market in every moment "*t*" according to the following formula:

$$\omega_t = \omega_{max} \cdot \frac{E[r]}{DR_{t-1}}$$

where $E[r]$ = the expected target return
with ω_t in the range of $0 \leq \omega_t \leq \omega_{max}$
In this way, if the return obtained in the recent past is higher than the expected return posed as the objective, the exposure for such determined asset is proportionately reduced in order to lower the unnecessary risk and limit the impact made by changes in future trend.
If $DR_{t-1}$is negative, the weight of ω_t will be equal to zero;
If $DR_{t-1} < E[r]$, then $\omega_t \equiv \omega_{max}$.
The idea is to try to obtain a return that is as constant in time as possible, while remaining well aware that there will be positive periods and negative periods, and therefore the lever must be calibrated to obtain the expected return in the long-term.

7. Case Study no. 3: an example of 0/100 Return Parity™ strategy

Let us now imagine another investor, Investor 4, who applies solely 0/100 strategy but adopts leverage and Return Parity™ strategy to improve his chances of obtaining the desired results.
We show how results change with the variation of both the Expected Return and the leverage employed in the process below:

Investor 4 investment process:

1) The 6-month Diaman Ratio is estimated for every single index every final day of the month.
2) If the DR for every single index is greater than -0.01, then the index analyzed will enter the portfolio the following month with a weight to determined subsequently.
3) The 12-month Diaman Ratio is estimated for the equity line created up to that month by the timing strategy described in the two points above.
4) The weight peso ω_t associated with every index derived from the formula described in Chapter 5 is calculated.
5) The negotiation costs estimated at 0.10% for the modifications with regard to the previous month are subtracted.
6) The new equity line created by the strategy for the following month is allowed to run.
7) The management costs (2% annual, in the example provided) for the month that has just passed are subtracted.
8) The procedure is adopted for every index in the investment assortment.
9) The result of the month calculated is added to the overall portfolio's equity line.
10) The procedure is repeated from Point 1.

This simulation brings different results on the basis of both the Expected Return programmed Ex-Ante and the leverage that the investor decides to adopt; in order to obtain returns higher than those obtained by the Full invested strategy (always at 100%), leverage must obviously be used; vice-versa, in order to obtain lower returns, the use of lesser leverage guarantees even better risk/return ratios.

Realized Return VS Expected Return			Leverage					
Expected Return	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
3%	2.3%	2.8%	3.2%	3.6%	4.0%	4.4%	4.7%	5.0%
4%	2.6%	3.1%	3.7%	4.3%	5.0%	5.6%	6.1%	6.6%
5%	2.8%	3.4%	4.1%	4.8%	5.5%	6.3%	7.0%	7.8%
6%	3.0%	3.7%	4.3%	5.1%	5.9%	6.8%	7.6%	8.5%
7%	3.2%	3.9%	4.6%	5.4%	6.3%	7.2%	8.1%	9.1%
8%	3.3%	4.1%	4.8%	5.7%	6.5%	7.5%	8.5%	9.6%
9%	3.3%	4.2%	5.0%	5.9%	6.8%	7.8%	8.8%	9.9%
10%	3.4%	4.2%	5.1%	6.1%	7.1%	8.1%	9.2%	10.3%

The positive effect of the use of Return Parity™ strategy in improving the various risk/return indicators is evident above all in the leverage required to obtain the 9% return realized for Investor 3, which no longer need be 200% because 140% is sufficient.

The two tables below show that both volatility and drawdown are decidedly lower whenever a Return Parity™ approach is used.

Realized Standard Deviation			Leverage					
Expected Return	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5

3%	3.4%	4.2%	4.9%	5.6%	6.4%	7.1%	7.9%	8.7%
4%	3.8%	4.6%	5.5%	6.4%	7.2%	8.1%	9.0%	10.0%
5%	4.1%	5.0%	5.9%	6.9%	7.8%	8.9%	10.0%	11.1%
6%	4.4%	5.3%	6.3%	7.3%	8.4%	9.5%	10.6%	11.8%
7%	4.6%	5.6%	6.7%	7.7%	8.9%	10.1%	11.3%	12.5%
8%	4.8%	5.9%	7.0%	8.1%	9.3%	10.6%	11.9%	13.2%
9%	5.0%	6.1%	7.2%	8.4%	9.7%	11.0%	12.4%	13.8%
10%	5.1%	6.3%	7.5%	8.7%	10.1%	11.4%	12.9%	14.4%

Maximum Drawdown				Leverage				
Expected Return	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
3%	-5.7%	-7.1%	-8.6%	-9.6%	-10.6%	-12.3%	-14.1%	-15.9%
4%	-6.4%	-7.7%	-9.1%	-10.7%	-12.0%	-13.2%	-14.5%	-16.4%
5%	-6.8%	-8.4%	-10.0%	-11.7%	-13.4%	-15.2%	-17.2%	-18.7%
6%	-6.9%	-8.6%	-10.5%	-12.4%	-14.3%	-16.4%	-18.4%	-20.5%
7%	-7.8%	-8.9%	-10.7%	-12.7%	-14.9%	-17.2%	-19.4%	-21.8%
8%	-8.6%	-9.9%	-11.1%	-13.0%	-15.2%	-17.6%	-20.2%	-22.7%
9%	-9.3%	-10.8%	-12.2%	-13.6%	-15.4%	-17.9%	-20.5%	-23.2%
10%	-9.4%	-11.6%	-13.2%	-14.8%	-16.3%	-18.1%	-20.7%	-23.5%

An analysis of the tables derived from the use of the Return Parity™ approach shows that Investor 4 who adopts a Return Parity™ approach can, in reality, significantly improve his return/risk profile as analyzed by all the statistical indicators considered:

	INV2	INV4
Realized Annual Return	5,0%	5,5%
Volatility	9,4%	7,8%
Max Drawdown	-19,9%	-13,4%
Ulcer Index	0,08	0,05
Martin Ratio	0,60	1,15
Sharpe Ratio*	0,53	0,71
Diaman Ratio	5,5%	5,9%

* Risk Free Rate 0%

8. Case Study no. 4: an example of Long/Short Return Parity™ strategy

The final case to be taken into consideration regards an Investor 5, who uses a Long/Short strategy adopting leverage and the Return Parity™ strategy to improve his chances of obtaining the desired results.

We show how results change with the variation of both the Expected Return and the leverage employed in the process below.

Investor 5 investment process:

1) The 6-month Diaman Ratio is estimated for every single index every final day of the month.
2) If the DR for every single index is greater than -0.01, then the following month the index analyzed will enter the portfolio with a Long position with a weight to determined subsequently; otherwise, if the DR value is lower than -0.01, then for the following month the position in the portfolio will be Short, with the variable weight decided in Point 4) below.
3) The 12-month Diaman Ratio is estimated for the equity line created up to that month by the timing strategy described in the two points above.
4) The weight peso ω_t associated with every index derived from the formula described in Chapter 5 is calculated.
5) The negotiation costs estimated at 0.10% for the modifications in regard to the previous month are subtracted.
6) The new equity line created by the strategy for the following month is allowed to run.
7) The management costs (2% annual, in the example provided) for the month that has just passed are subtracted.
8) The procedure is adopted for every index in the investment assortment.
9) The result of the month calculated is added to the overall portfolio's equity line.
10) The procedure is repeated from Point 1.

The same considerations made for Investor 4 also apply to Investor 5; in other words, that different returns are realized on the basis of the Expected Return programmed Ex-Ante and the leverage used to obtain such returns

Realized Return VS Expected Return	Leverage							
Expected Return	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
3%	3.6%	4.2%	4.9%	5.5%	6.2%	6.8%	7.4%	8.0%
4%	3.9%	4.6%	5.3%	6.1%	7.0%	7.8%	8.7%	9.5%
5%	4.1%	4.9%	5.7%	6.5%	7.5%	8.4%	9.4%	10.4%
6%	4.4%	5.1%	6.0%	6.9%	7.9%	8.9%	10.0%	11.1%
7%	4.6%	5.4%	6.2%	7.2%	8.2%	9.3%	10.4%	11.6%
8%	4.7%	5.6%	6.5%	7.5%	8.5%	9.6%	10.8%	12.0%
9%	4.7%	5.7%	6.7%	7.8%	8.9%	10.0%	11.1%	12.4%
10%	4.8%	5.7%	6.8%	8.0%	9.2%	10.4%	11.6%	12.8%

Realized Standard Deviation	Leverage							
Expected Return	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
3%	5.9%	6.7%	7.6%	8.5%	9.3%	10.2%	11.1%	12.0%
4%	6.1%	7.0%	8.0%	9.0%	9.9%	10.9%	11.9%	12.9%
5%	6.3%	7.3%	8.3%	9.3%	10.4%	11.5%	12.6%	13.8%
6%	6.5%	7.5%	8.6%	9.7%	10.8%	12.0%	13.2%	14.4%
7%	6.7%	7.8%	8.9%	10.0%	11.2%	12.5%	13.7%	15.0%

8%	6.8%	7.9%	9.1%	10.3%	11.6%	12.9%	14.2%	15.6%
9%	6.9%	8.1%	9.3%	10.6%	11.9%	13.3%	14.7%	16.1%
10%	7.1%	8.2%	9.5%	10.8%	12.2%	13.6%	15.1%	16.6%

Maximum Drawdown		Leverage						
Expected Return	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
3%	-10.5%	-11.5%	-12.3%	-13.0%	-13.8%	-14.6%	-15.6%	-16.9%
4%	-11.8%	-13.3%	-14.7%	-16.1%	-17.2%	-18.1%	-18.9%	-19.6%
5%	-12.7%	-14.6%	-16.3%	-18.0%	-19.6%	-21.1%	-22.7%	-23.7%
6%	-12.9%	-15.2%	-17.4%	-19.5%	-21.4%	-23.2%	-25.0%	-26.6%
7%	-13.0%	-15.3%	-17.8%	-20.3%	-22.6%	-24.8%	-26.9%	-28.9%
8%	-13.2%	-15.5%	-18.0%	-20.5%	-23.3%	-25.9%	-28.4%	-30.7%
9%	-13.3%	-15.7%	-18.1%	-20.7%	-23.5%	-26.3%	-29.2%	-31.8%
10%	-13.4%	-15.8%	-18.3%	-20.9%	-23.7%	-26.5%	-29.4%	-32.5%

A comparison between Investor 3 and Investor 5, both of whom use the same mathematical model to go Long or Short in the market shows that the sole difference lies in the fact that Investor 5 uses also a Return Parity™ approach and illustrates other various differences that although not as significant as in the case of 0/100 strategy are interesting just the same:

	INV3	INV5
Realized Annual Return	7.1%	7.2%
Volatility	10.4%	10.0%
Max Drawdown	-18.8%	-20.3%
Ulcer Index	0.06	0.05
Martin Ratio	1.11	1.24
Sharpe Ratio*	0.68	0.71
Diaman Ratio	5.7%	7.4%

* Risk Free Rate 0%

8. Conclusions

In this paper, we propose a new approach referred to as Return Parity™ with the purpose of increasing awareness in the asset management industry of the need to find new ways to meet investors' needs, in other words, new ways to ensure that the expected return decided ex-ante coincides as closely as possible with the return realized ex-post.
Surely many other methods to achieve this objective will emerge, and we will be willing to study and use them.
In the four case studies we presented, we were able to verify the validity of the Diaman Ratio from two different perspectives. Firstly, despite being on monthly basis, the indicator is useful to estimate the moments to enter and exit markets, giving added value to the investors. Secondly, it is a calibrator of the weight to be assigned to each single asset class in order to obtain the expected return decided ex-ante.

The results show that the use of both leverage and this approach permits the best possible modulation of the expected returns and the realization of satisfying results, even after accounting for the non-insignificant management costs involved.

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