

TrackInsightTM ETF Ratings – Methodology

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I - Introduction

The TrackInsight™ ETF ratings provide investors with a comprehensive framework for selecting best-in-class ETFs based on an audited analysis of the relative performance of the funds in relation to their official benchmarks. This document sets forth the methodology used to produce the ratings in a systematic, transparent and repeatable manner.

Ratings are unsolicited and free; TrackInsight has undertaken all possible efforts to ensure the investment universe is complete and to guarantee the quality of the data and the transparency of the rating process.

The ratings are solely based on historical data, investors should complement the information gained using this methodology with in-depth qualitative due diligence.

II- ETF eligibility, categories, rating process and A-list

In order to benefit from a rating, an ETF is required to fulfil a number of criteria that ensure it is relevant for institutional investors' portfolios. Eligible funds are grouped into categories exhibiting comparable replication complexity so that a peer group analysis can be conducted.

1. Eligibility

All available ETFs on www.trackinsight.com and benefiting from a track record equal to or longer than 3 years are eligible to be rated within one of the categories described below.

As such, the investment universe is restricted to delta one ETFs and therefore excludes certificates, notes, leveraged and inverse ETFs.

2. Categories

The investment universes considered include the 13 following categories and distinguish the dividend policy of the benchmarks. "NTR" stands for net total return and "GTR" for gross total return.

1. Developed Market Europe Large Cap Equities, NTR
2. Developed Market Europe Large Cap Equities, GTR
3. Developed Market North America Large Cap Equities, NTR
4. Global Market Large Cap Equities, NTR
5. Developed Market Asia Large Cap Equities, NTR
6. Developed Market Asia Large Cap Equities, GTR
7. Global Market Small Cap Equities, NTR
8. Emerging Market Equities, NTR
9. Developed Market Government Bonds, GTR
10. Emerging Market Bonds, GTR
11. Developed Market Corporate Investment Grade Bonds, GTR

12. Developed Market Corporate High Yield Bonds, GTR

13. Commodities, GTR

New categories may be subsequently added should they contain at least 5 rated funds.

3. Rating process

TrackInsight™ ratings are updated on a half-year basis (January and June) according to the process described hereafter. They will be displayed online over the following month.

a. Criteria considered to produce the ratings

Four statistical measures (*cf. Appendix for in-depth descriptions*) are calculated for each ETF within each category using daily ETF NAVs and index closing prices over the last three years:

- a) **Difference of annualised performance (tracking difference),**
- b) **Volatility of excess returns (tracking error),**
- c) **Long-term persistence of excess returns (Hurst exponent),**
- d) **Width of extreme excess returns (kurtosis).**

b. Quality thresholds

Within each ETF category, we compute the **median values**¹ as quality thresholds for the aforementioned criteria a), b), and d). Regarding the criterion c), we use 0.5 as the threshold quality level.

All Europe & North America domiciled ETFs are available on TrackInsight. However, because these two markets differ in many aspects, we decided to rate the European ETFs and North American ETFs independently.

This requires computing for each of the thirteen categories displayed above two median value; a European one (from European listed ETFs) and a North American one (from North America listed ETFs). Each fund is then compared to their respective median value and ratings are determined following the methodology detailed below.

¹ Median value: The number separating the higher half of the ETFs considered within a category from the lower half.

c. Ratings: from nil to five stars

Within each category, ETFs are rated according to how they fulfil criteria a, b, c and d as follows:

ETF Rating	Conditions
★★★★★	<ul style="list-style-type: none"> a) is greater than the corresponding median value b) is lower than the corresponding median value c) is higher than 0.5 d) is lower than the corresponding median value
★★★★	<ul style="list-style-type: none"> a) is greater than the corresponding median value b) is lower than the corresponding median value c) is higher than 0.5 OR d) is lower than the corresponding median value
★★★	<ul style="list-style-type: none"> a) is greater than the corresponding median value b) is lower than the corresponding median value
★★	<ul style="list-style-type: none"> a) is greater than the corresponding median value OR b) is lower than the corresponding median value c) is higher than 0.5 OR d) is lower than the corresponding median value (<i>or both</i>)
★	<ul style="list-style-type: none"> a) is greater than the corresponding median value OR b) is lower than the corresponding median value
Zero Star	<ul style="list-style-type: none"> a) is NOT greater than the corresponding median value AND b) is NOT lower than the corresponding median value
Non Rated	The ETF has a track record of less than 3 years

TrackInsight™ A-list

4. TrackInsight A-list: from 3 to 5 stars

ETFs rated from **three to five stars** are best-in-class funds that constitute the **'TrackInsight A-list'** (*orange framing as shown in the above table*). Those ETFs are funds that can be considered as 'best-in-class' for both their **Tracking Difference** and **Tracking Error qualities**.

a. Entrance conditions

In order to enter the A-list, an ETF must fulfil a unique condition: be rated 3, 4 or 5 stars at one of the bi-annual rating process.

b. Exit conditions

An ETF that receives a rate lower than 3 stars twice in a row is excluded from the A-list. To be reintegrated, it will have to meet the entrance conditions described above at a forthcoming release of ratings.

Appendix

Each of the four statistical measures inherent to the TrackInsight™ rating methodology intends to capture a specific aspect of ETF replication quality.

1. Difference of annualised performance (tracking difference)

The difference of annualised performance, **or tracking difference**, denotes the difference between the ETF's annualised performance – based on the official Net Asset Value (NAV) – and that of the index officially tracked over a given period. The tracking difference does not include the costs inherent in trading the ETF shares, costs that are specific to the investor's portfolio.

2. Volatility of excess returns (tracking error)

The volatility of excess returns, **or tracking error**, denotes the annualised volatility of the daily return difference between the ETF and the index it officially tracks over a given period. The volatility is annualised using a 260 day basis (daily volatility multiplied by the square root of 260).

If N denotes the length of the excess-return data sample $x = (x_1, x_2, \dots, x_N)$, then the tracking error TE of x , is defined as

$$TE = \sqrt{260} \times \sigma(x),$$

$$\text{where } \sigma(x) = \sqrt{\frac{1}{(N-1)} \times \sum_{i=1}^N (x_i - \text{mean}(x))^2}, \quad \text{and } \text{mean}(x) = \frac{1}{N} \times \sum_{i=1}^N x_i$$

3. Long-term persistence of excess returns (hurst exponent)

When using statistics to analyse the (relative) performance of an investment vehicle, the length of the data sample and the time period significantly affect the calculations. Investigating the persistence of the relative performance of an ETF across a range of dates – and not only its sample performance - is also meaningful as it allows to spot potential inconsistency in ETF relative performance.

The long-term persistence of daily return difference between the ETF and its corresponding tracked index (excess returns) over time is assessed using **the Hurst coefficient**. This indicator captures the degree of long-term autocorrelation in excess returns of an ETF. The higher the Hurst coefficient, the higher the likelihood that past excess returns will be followed by similar excess returns. We reward funds having a Hurst exponent strictly greater than 0.5, this is the threshold for identifying funds, which have persistent (relative) performance.

If N denotes the length of the excess-return data sample $x = (x_1, x_2, \dots, x_N)$, $\sigma(x)$ the standard deviation of x , and $\text{mean}(x)$ the sample mean of x , then the Hurst exponent H is defined as follow:

Let $Z_i = (x_i - \text{mean}(x))$, for $i = 1, \dots, N$, be the mean-adjusted sample,

$Y_i = \sum_{s=1}^i Z_s$, for $i = 1, \dots, N$, the cumulative deviate sample,

$Y_1 = \max_{0 < i < N+1} Y_i$, the maximum cumulative deviation,

$Y_2 = \min_{0 < i < N+1} Y_i$, the minimum cumulative deviation,

$$\text{then } H = \frac{1}{\ln(N)} \ln\left(\frac{Y_1 - Y_2}{\sigma(x)}\right).$$

4. Width of extreme excess returns (kurtosis)

The width of extreme excess returns, or **(excess) kurtosis** of daily return difference between the ETF and its corresponding tracked index, quantifies tail weight of excess returns distribution. High kurtosis means infrequent extreme return deviations are observed on the ETF with respect to its benchmark index.

If N denotes the length of the excess-return data sample $x = (x_1, x_2, \dots, x_N)$, $\sigma(x)$ the standard deviation of x , and $\text{mean}(x)$ the sample mean of x , then κ , the kurtosis of x , is defined as

$$\kappa = \frac{N(N+1)}{(N-1)(N-2)(N-3)} \times \frac{1}{\sigma(x)^4} \times \sum_{i=1}^N (x_i - \text{mean}(x))^4 - 3 \times \frac{(N-1)^2}{(N-2)(N-3)}$$

TrackInsight™ (www.trackinsight.com)

TrackInsight™ was created to make sure you have always got the full picture, bringing you independent up-to-date analysis and reliable, transparent information on over more than 3500 ETFs listed in Europe and in North America.

Clear and intuitive, the dashboard has been designed to enable you to easily search, compare and select, to ensure you make the most informed investment moves.

Methodology version	Date	Comments
v1.0	29/05/2015	<ul style="list-style-type: none"> • Initial release
v1.1	21/08/2015	<ul style="list-style-type: none"> • Distinction between NTR and GTR funds • Withdrawal of the “negative watch policy” when an ETF has been downgraded after a data update.
V1.2	12/08/2016	<ul style="list-style-type: none"> • Amendment of the rating periodicity from quarterly to bi-annually • A-List Methodology with the entry and exit conditions
V1.3	24/04/2017	<ul style="list-style-type: none"> • Addition of the North America domiciled ETFs • Removal of the 50 M€ AUM requirement to be rated