



ENTROPIATECH

Index Methodology

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EntropiaTech

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1. Why Entropy in Quantitative Finance

Classical Science emphasized order and stability; in contrast, we see fluctuations, instability [...] and limited predictability at all levels of observation.

— Ilya Prigogine

Entropy is the essential element of this scientific outlook, which deals with the irreversible and time-oriented processes at play in complex systems. Entropy, combined with an information-based approach, can therefore help provide the timing elements needed to partially describe the behaviour of a market. Consequently, entropy and timing are intrinsically linked through the interpretability of information.

The concepts and principles of entropy can be used more widely in asset pricing. It helps scholars tackle the general problem of extracting asset probability distributions from limited and incomplete market information. It is also helpful in solving canonical option valuation problems. Entropy pricing theory and the principle of maximum entropy are used frequently in setting up pricing models and developing corresponding algorithms.

— Rongxi Zhou et al.

2. Entropy and Markets Research

A central question for the methodology is: can these concepts be expressed in financial-market terms?

2.1 Entropy in Information Theory (Background)

Entropy, introduced by Claude Shannon, measures the uncertainty or information content of a system:

$$H = - \sum p(x) \log p(x)$$

where $p(x_i)$ is the probability of each possible outcome, x_i being a price variation. The robustness approach proposes to compute an Entropy Score, renormalized on a 100% basis, to measure the daily entropy production of each underlying — based on all intraday data (see following sections). A higher entropy production indicates greater unpredictability.

2.2 Entropy in Finance

In finance, entropy measures uncertainty, randomness, or disorder within financial systems — similarly to its role in physics or information theory.

Market Uncertainty / Volatility — entropy can measure market unpredictability more holistically than variance or standard deviation. For example, when price returns follow a flatter, more uniform distribution, entropy is high, indicating greater uncertainty.

- Use case: researchers often compare the Shannon entropy of asset returns to standard volatility measures. During financial crises, entropy tends to spike before volatility does.

3. Using the Entropia Score to Identify Uncertainty

The Entropia Score measures uncertainty and trend across all major asset classes — Equities, Government Bonds, Corporate Bonds, Forex, Equity Volatility, Credit Volatility, Commodities, and Crypto.

Every day, 30 minutes before the US market close, this measure returns a value between 0% and 100% of uncertainty for each asset class, computed using an entropy-production oscillator.

Example: $Entropia_Score_SP500[date] = 22\%$

Using every individual Entropia Score, a global (holistic) Market Entropia Score is derived from the average of all asset-class Entropia Scores together with the entropy production between the current day and the previous day. This Global Entropia Score is not renormalized and can therefore return a value between 0% and an unbounded positive percentage.

Example: $Entropia_Global_Score[date] = 32\%$

Combining the Entropia Score and the Entropia Global Score makes it possible to compute the optimal entropy exposure for a given asset class (or associated strategy) for the following day, using the formula below:

$$SP500_Entropy_Allocation[date] = (1 - Entropia_Score_SP500[date]) \times (1 - Entropia_Global_Score[date])$$

4. Using the Entropia Global Score to Compute a Daily Overlay

The Entropia Global Score provides a daily indication of the level of disorder in global markets. This makes it possible to allocate a level of overlay each day, following the process below.

- Two instruments are used to apply the best-effort overlay: the Equity VIX Future (for VIX-influenced asset classes) and Credit CDX (CDX 5Y HY and Short IBHY).
- A ratio is applied between the asset allocation and the overlay instrument.

Example: $VIX_Overlay_Ratio = SPX_Volatility / VIX_Future_Volatility$ (e.g. 23%)

The appropriate level of permanent overlay allocation is then computed using the following formula:

$Entropia_Score_Overlay[date] = VIX_Overlay_Ratio \times Entropia_Global_Score$

Each day, the resulting allocation returns a long-asset and long-volatility position, approximating a market-neutral approach.

*Example: $SP500_Entropy_Allocation[date]$ and $VIX_Entropy_Overlay[date]$
 $\{(1-22\%) \times (1-32\%), SPX\}$ and $\{(23\%) \times (32\%), VIX\ Future\}$*

5. Historical Daily Entropia Score Smart Data by Asset

The table below presents the historical daily Entropia Score computed for each individual instrument across all major asset classes, alongside the resulting daily Entropy Production — the basis for the Global Market Entropia Score referenced throughout this methodology.

Figure 1 — Instrument-level Entropia Score and daily Entropy Production, historical data

Each column corresponds to an asset class or instrument (World Equities, World Rates, Bonds, VIX, Credit CDX, FX pairs, Commodities, Gold, and BTCUSD), while the rightmost column aggregates the daily Entropy Production used to derive the Global Market Entropia Score.

(c) EntropiaTech

6. Strategy Summaries

The following pages present the twelve investment strategies managed by EntropiaTech as of June 30, 2026. Each strategy is built on the same entropy-driven scientific foundation — the Entropia Score and Global Entropia Score — applied across different asset universes, risk budgets and hedging configurations.

6.1 Global Macro

Inception: Nov 6, 2018 · Asset class: Multi-Asset

A diversified multi-asset strategy spanning equities, rates, credit, FX, commodities and crypto. Systematic entropy signals drive dynamic allocation and risk overlays across all market regimes, targeting high risk-adjusted returns with disciplined drawdown control. The Entropia Score guides daily exposure adjustments across all major asset classes, while the Global Entropia Score activates VIX and CDX overlays during periods of elevated cross-asset stress.

6.2 Global Macro Plus

Inception: Nov 6, 2018 · Asset class: Multi-Asset

An enhanced version of the Global Macro strategy with a higher risk budget and broader asset universe. Entropy-driven allocation is amplified during favourable regimes, delivering superior long-term compounding while preserving the same entropy-based risk framework. Position sizing is scaled up when the Global Entropia Score confirms a calm, diversified market environment.

6.3 Global Macro Hedge

Inception: Nov 6, 2018 · Asset class: Multi-Asset

The Global Macro strategy augmented with systematic hedging overlays via VIX futures and CDX instruments. Active entropy-based overlays dynamically reduce portfolio exposure during stress episodes while preserving upside participation in calm regimes. The hedging layer activates proportionally to the Global Entropia Score, ensuring a market-neutral tilt during peak uncertainty.

6.4 Absolute Return

Inception: Nov 6, 2018 · Asset class: Multi-Asset

A low-volatility absolute return strategy combining conservative multi-asset allocation with entropy-driven risk management. Designed to deliver consistent positive returns across all market regimes with exceptional drawdown protection and minimal correlation to traditional benchmarks. The Entropia Score filters out high-uncertainty periods, keeping the portfolio in cash-equivalent positions when market disorder exceeds defined thresholds.

6.5 Absolute Return Plus

Inception: Nov 6, 2018 · Asset class: Multi-Asset

An absolute return strategy combining multi-asset allocation with active CDS, CDX and VIX hedging overlays. The Plus variant adds systematic volatility and credit hedges to the base strategy, delivering consistent positive returns with superior drawdown protection across all market regimes. Hedge ratios are recalculated daily using the entropy allocation formula.

6.6 Absolute Return Prudent

Inception: Nov 6, 2018 · Asset class: Multi-Asset

The most conservative variant of the Absolute Return family. A capital-preservation-first strategy with a strict volatility budget and enhanced entropy filtering, designed for investors requiring consistent positive returns with the lowest possible drawdown profile. Exposure to any single asset class is capped at levels determined by both the individual Entropia Score and the Global Entropia Score.

6.7 Global Equities

Inception: Nov 6, 2018 · Asset class: Equities

A long-biased global equities strategy driven by entropy signals across world equity markets. The entropy oscillator identifies optimal entry and exit points across developed and emerging markets, while the Global Entropia Score dynamically adjusts overall market exposure to reduce risk during volatility spikes and correlation breakdowns.

6.8 Global Equities Hedged

Inception: Nov 6, 2018 · Asset class: Equities

The Global Equities strategy with systematic VIX and CDX hedging overlays. The hedging layer activates dynamically based on the Global Entropia Score, providing downside protection during volatility spikes while preserving full equity participation in calm, ordered markets. The VIX overlay ratio is recomputed daily using realised versus implied volatility spread.

6.9 Global Bonds

Inception: Nov 6, 2018 · Asset class: Fixed Income

A multi-sector fixed income strategy across government bonds, investment-grade and high-yield credit, and emerging market debt. Entropy signals drive duration and credit allocation dynamically, with the Global Entropia Score modulating overall fixed income exposure to reduce sensitivity to rates and credit volatility episodes.

6.10 Global Bonds Hedged

Inception: Nov 6, 2018 · Asset class: Fixed Income

The Global Bonds strategy augmented with systematic CDS and CDX credit hedges. Active entropy-based overlays protect the portfolio during credit spread widening and rates volatility episodes, delivering superior risk-adjusted fixed income returns with significantly reduced tail risk. The CDX hedge size is proportional to the daily Global Entropia Score output.

6.11 Crypto Trading

Inception: Oct 12, 2024 · Asset class: Digital Assets

A quantitative intraday trading strategy on BTC, ETH, BNB, SOL and XRP. Based on the third law of thermodynamics, entropy extrema combined with dynamic CCI signals identify high-probability market turning points within each 30-minute bar. Trade, stop-loss and take-profit orders are submitted simultaneously; the market must confirm the expected direction before any fill occurs — unconfirmed cycles are discarded at zero cost. Loss per trade is strictly capped at 10 bps + slippage; positions are held between 0.5 and 6 hours maximum with no overnight exposure.

6.12 Crypto Trading Adaptive

Inception: Oct 12, 2024 · Asset class: Digital Assets

The Crypto Trading strategy with dynamic trade allocation pondered by the global market Entropia Score. Each trade size is automatically amplified when cross-asset entropy is high (calm, diversified regime) and reduced when the Global Entropia Score signals stress across asset classes. This creates a natural regime filter: the strategy deploys maximum capital when global conditions are most favourable for crypto entropy cycles, and minimum capital during broad market stress episodes. Statistics are computed on a 365-day annualisation basis to reflect the continuous nature of crypto markets.

7. Scientific Foundation: Entropy vs. Volatility

Volatility — measured as the standard deviation of returns — has been the dominant risk metric in quantitative finance since Markowitz (1952). Yet entropy offers a fundamentally different and richer characterisation of market uncertainty. The following synthesises the key distinctions and the scientific rationale for entropy-based risk management as applied across all EntropiaTech strategies.

7.1 Why Entropy Precedes Volatility

Shannon entropy measures the informational complexity of a probability distribution — not merely its spread. When price returns follow a flat, uniform distribution, entropy is maximised but variance may appear moderate. Conversely, a highly peaked distribution has low entropy even if occasional extreme events inflate realised volatility. This distinction is critical: entropy captures the structural disorder of a market regime, while volatility measures only historical dispersion.

Empirical research consistently shows that entropy spikes precede volatility spikes during financial crises. In the 2008 crisis, the 2010 Flash Crash, the 2020 COVID shock and the 2022 rates crisis, entropy-based signals provided earlier warnings than standard volatility measures (Gradojevic & Caric, 2017; Fernandez-Mejia et al., 2025). This lead-time advantage is the core scientific justification for entropy-driven allocation and overlay strategies.

7.2 Entropy as a Regime Classifier

The Entropia Score (0–100%) classifies each asset class into regimes along a single scalar dimension: 0% corresponds to maximum order (perfectly predictable, trend-following) and 100% to maximum disorder (fully random, mean-reverting). This formulation is grounded in the Boltzmann–Gibbs statistical mechanics framework applied to price-return distributions.

Because crypto markets trade 24/7 without session boundaries, the Entropia Score for crypto assets is computed on a 365-day annualisation basis — the only strategy family where this convention departs from the standard 252-day equity market convention used across all other EntropiaTech strategies.

7.3 Entropy vs. Volatility — Key Distinctions

Dimension	Standard Volatility (σ)	EntropiaTech Entropy Score
Theoretical basis	Statistical mechanics (variance)	Information theory (Shannon, 1948)
What it measures	Dispersion of past returns	Informational complexity of price distribution
Crisis lead time	Contemporaneous or lagged	Leads by hours to days (empirically verified)
Distribution assumption	Gaussian (implicitly)	Distribution-free — any shape captured
Regime detection	Threshold-based (e.g. VIX > 20)	Continuous score 0–100% per asset class
Tail risk	Underestimates fat tails	Captures full distributional shape
Allocation signal	Inverse volatility weighting	Entropy allocation formula (§3)
Overlay trigger	Fixed rule-based thresholds	Dynamic: Global Entropy Score × Overlay Ratio
Crypto convention	252-day standard	365-day continuous markets
Strategy application	Ex-post risk measurement	Forward-looking allocation signal

7.4 Key Scientific References

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