

Trading Engine powered by Disruptive Technology

CGS Engine Quants

Meet the Founding Quants

Yeonwoo Choi

- A former top student at Korea Science Academy for the Gifted, he later earned degrees from Seoul National University and the University of Pennsylvania. A licensed attorney in both Korea and New York, and a partner at one of Korea's largest law firms, yet the legal work is almost a sideline; he pours the bulk of his time and energy into his true passion — Technology.
- System Architecture and Modeling, Trading Execution Deployment.

Jinwook Lee

- Brings extensive expertise in financial modeling, with a strong focus on risk measurement. His work centers on mathematical programming and AI system design. Dr. Lee holds a PhD in Operations Research from Rutgers and completed his undergraduate studies at Yonsei University. He is currently a professor at Drexel University.
- Quantitative Strategy, Financial Modeling/Engineering with Mathematical Validation.

We Invented CGS Tech Engine

Founders & Origin

Where It All Began: Two Nerds in Philly (2019)

- Jinwook is a professor at Drexel University, where he teaches MBA students with a focus on computational and mathematical programming. His research includes multiple publications on Value-at-Risk and its applications in finance.
- In 2019, Jinwook met Yeonwoo while Yeonwoo was pursuing graduate studies at the University of Pennsylvania.
- From the start, they shared an intense fascination and deep obsession with programming, mathematics and puzzle solving.

Obsession: Time-Series Data

- They ended up spotting a fanciest puzzle to solve - the complexity of the time-series data - a puzzle which, once solved, would unlock the door to countless other complex problems.
- Soon they became deeply obsessed with extracting refined and meaningful signals and eliminating noise from massive chunk of numerical datasets.

We Invented CGS Tech Engine

Challenges & Solutions

Challenges

- Time-series data across industries riddled with noise - weather; trading; power-grid fluctuations
- Conventional models struggle to generalize across domains

Our Approach

- Our belief was complex-system dataset could be refined by intrinsic mathematical properties
- Based on such belief, after enduring the painful process of formulating hypotheses and running countless simulations, we “discovered” something new

Solutions

- We created the CGS Engine, a signal-processing system that systematically applies algebraic and geometric analyses to time-series big data.
- Our engine removes noise and detects hidden patterns across any time-series dataset.
- The engine is applicable to diverse domains and, when installed, adapts seamlessly—even to weather forecasting.

We Invented CGS Tech Engine

Commercialization initiated

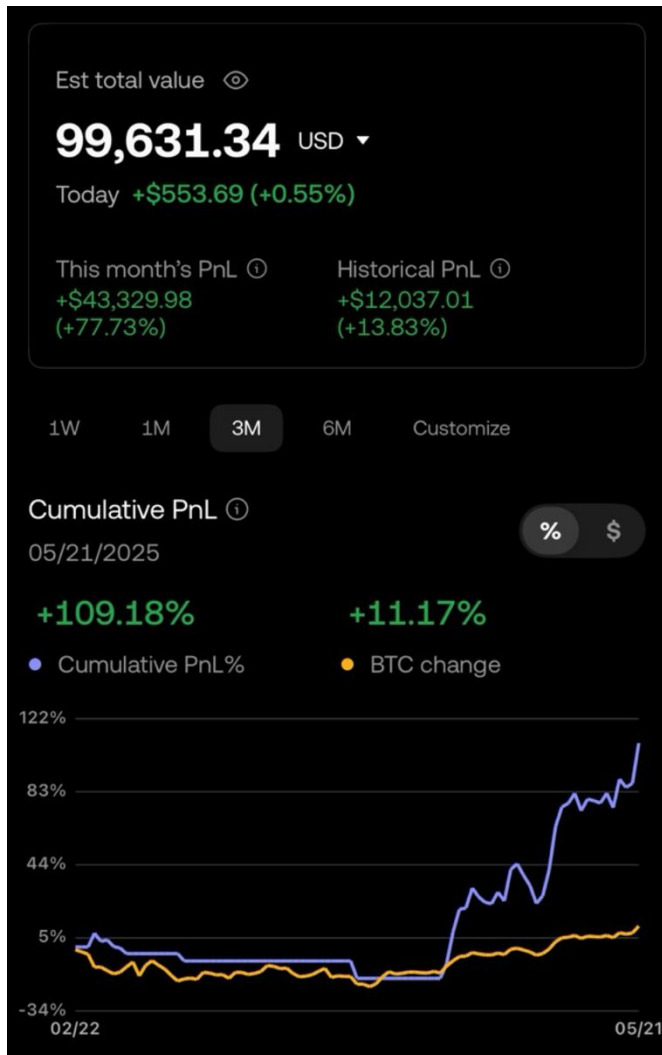
Traction

- We implemented our engine to be an autonomous live trading system.
- System ideation completed in 2021, and establishment of core infrastructure and live real-market condition test conducted by 2023.
- In 2024, a soft launch initiated, deploying personal capital to validate our system in real market.

Now, we are aiming to build a new hedge-fund powered by disruptive technology, which will rewrite the history of trading

- Our trading platform capitalizes on volatility through a proprietary, in-house algorithmic engine with a track record of proven performance.
- Robust risk management is seamlessly embedded into our core infrastructure.

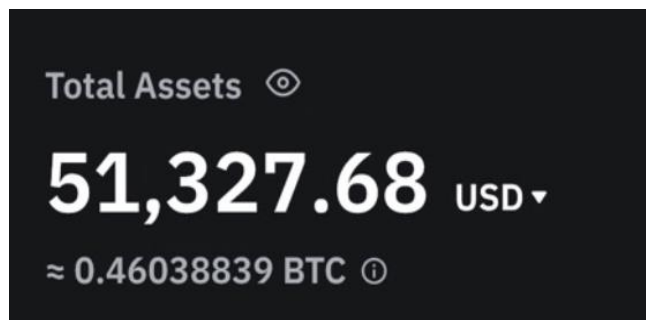
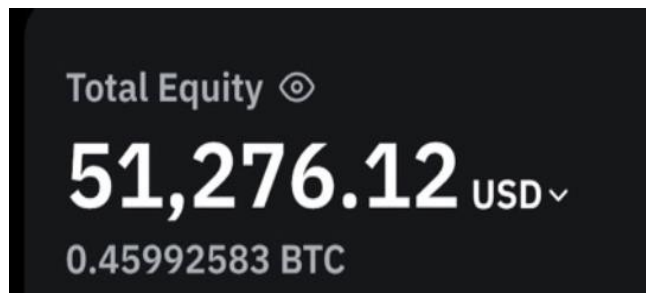
We Invented CGS Tech Engine



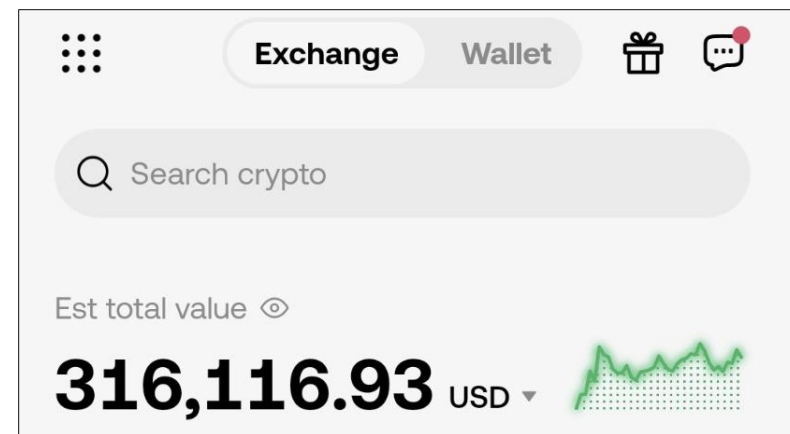
2025

Personal capital deployed since mid-November 2024

Recording +120% ROI as of July 2025 (USD 518,350 in operation)



CGS Engine Quants



What is it?

What defines CGS Engine?

Autonomous AI-bot Trading system

- Human intervention brings emotions and mistakes into the process, increasing risk.
- The U.S. securities markets will soon operate 24/7, where only automated quants can respond to the markets effectively - we've built an automated trading system to meet that shift.

Numeric data-refinement

- Each AI-bot's Logics driving those trades: Each bot relies on the data-processing signals generated by the CGS engine.

Robot Army Execution: portfolio effect with a single asset class

- Our automated bot-trading system is designed to achieve a portfolio effect regardless of the underlying asset, thereby significantly lowering risk exposure.
- Between 200 and 10,000 robot traders with different profiles/features spread the seed capital across multiple positions.
- System's General Manager bot aggregates and synthesizes all the incoming signals and then executes the trades.

How does it work?

Multi-AI-bot system with numerous single AI-bots

- CGS operates as an “**army of bots**” trading system. Each bot uses the CGS engine to refine data signals, then buys and sells target assets.
- The basic execution logic for each bot works as in below (while the actual is much more complex):

(Step 1) Initial Operation: Searching for equilibrium signals while standby.

(Step 2) Equilibrium Signal Capture Phase: Once an equilibrium signal is captured, the system remains on standby, preparing for a bet while maintaining the state.

(Step 3) Preliminary Signal Betting Phase: A bet is placed when a preliminary signal is confirmed.

(Step 4) Post-Analysis and Confirmation of Preliminary Signals: Conducting an evaluation to determine whether the signal is a true uptrend/downtrend.

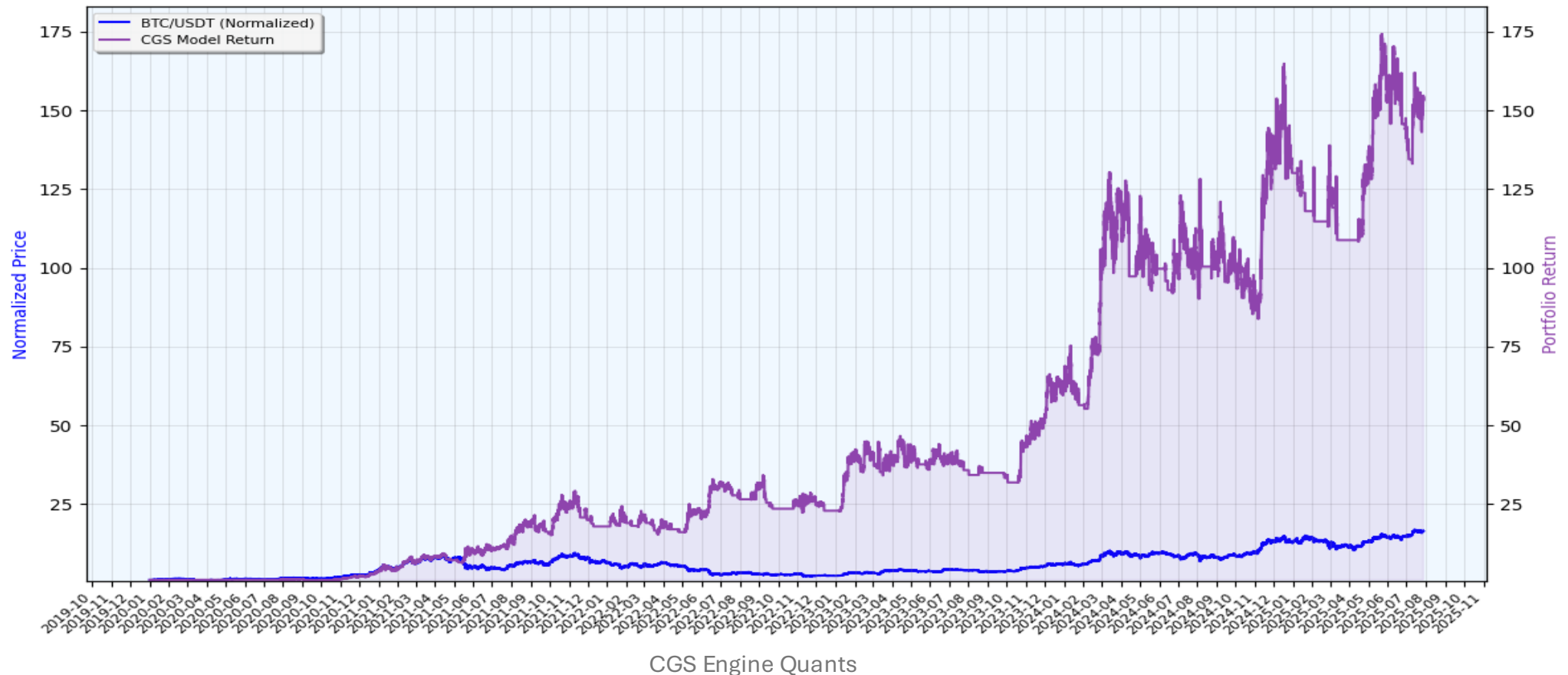
- **If a true signal is confirmed:** Continue holding the betting position.
- **Else:** (1) Perform a loss cut to close the position; (2) Process noise data and redefine the next preliminary signal. Then, proceed with steps 3 and 4 when the next preliminary signal is observed.

(Step 5) Holding the betting position until the next equilibrium status. Once the next equilibrium signal is captured, the position is closed to take profit, then the process returns to Step 2.

How well does it work?

BTC vs BTC CGS Engine

- The chart below shows the cumulative return from investing in BTC using the CGS engine over the past five and a half years. The **blue line** depicts **BTC** price which rose roughly **13x with CAGR (+) 67.02%**, while over the same period the **Purple-line** of the **CGS BTC returns above 150x with CAGR (+)172%**.



How well does it work?

What if the market is down?

- The chart below shows how CGS works in the down market like BTC in the year of 2022
- The **Blue-line BTC** price recorded **(-)50%**, while the **Purple-line CGS cumulative return** recorded **(+)25%**
- CGS employs both long and short derivative trades. Marks in color on the blueline represent actions



How well does it work?

What about drawdown volatility risk?

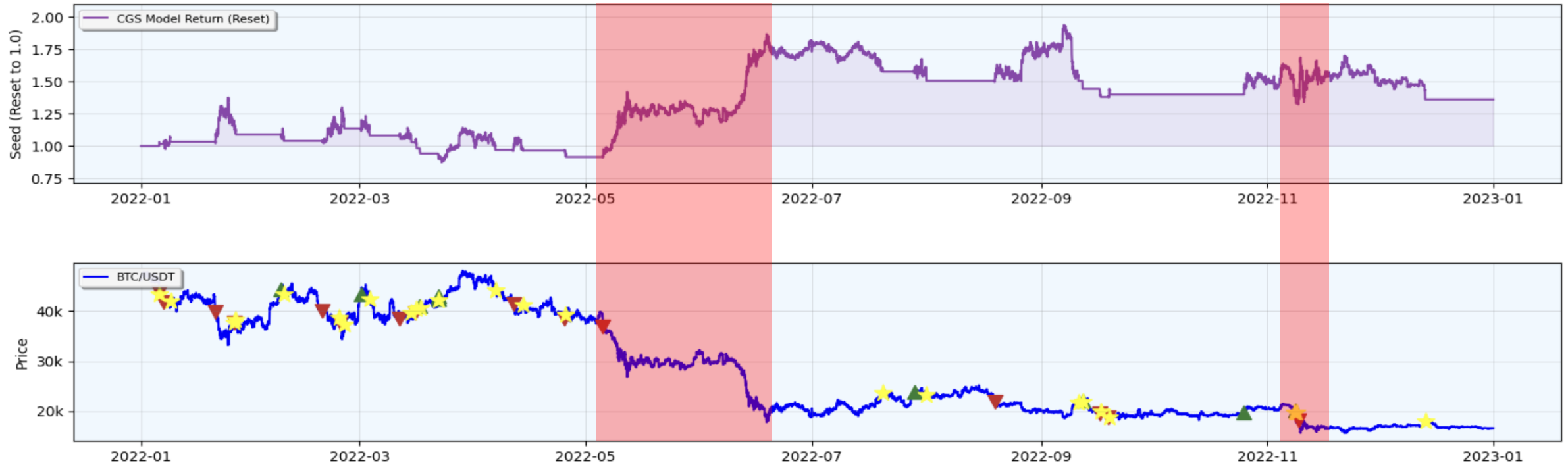
- Beyond ROIs, the drawdown (how deep the trading seeds fall from the most recent highest value) is a crucial metric for risk management; the smaller the drawdown, the stronger the performance.
- On top of the overwhelming returns, CGS also delivers outstanding drawdowns.
- In the bottom chart, **red-line** represents the much smaller **drawdown in CGS** against **BTC's blue-line**.



For a deeper look at detailed CGS system's Risk/Return data, refer to the Annex.

Resilience in Market Crises

This chart highlights how the CGS model performed during two of the most severe market disruptions in 2022.



LUNA Collapse (UST Depeg)

- May 7-8, 2022: Initial depeg
- May 11, 2022: Full collapse and blockchain halt
- Until late June: Broader fallout effects across the crypto market

FTX's Collapse

- Nov 8, 2022: Halted customer withdrawals
- Nov 11, 2022: Filed for bankruptcy
- Nov 12-13: Major wallet hack drained hundreds of millions

The CGS model avoided catastrophic drawdowns!

Risk Control: Stop-Loss and No-Trade Protocols

Stop-Loss Logic – Post Analysis of True Signals

- After a **preliminary signal** is acted upon, the system enters a **post-analysis phase** to verify if it aligns with a *true signal* (confirmed trend).
- If **post-analysis** determines the signal was false (trend invalidated):
 - **Trigger Stop-Loss** — Close the position immediately to limit drawdown.
 - **Noise Processing** — Reclassify the invalidated movement as *data noise*.
 - Return to signal-search mode to await the next valid preliminary signal.

No-Trade Logic – Data Noise & Equilibrium Zones

- During **equilibrium phases** (price movements within a low-volatility range) or periods dominated by **data noise** (determined by the **CGS Engine Noise Processing** process):
 - **No trades are initiated** — the system remains in standby.
 - Prevents unnecessary losses and protects capital during sideways or choppy markets.
 - Trading resumes only when a new **preliminary signal** is captured, leading back to the betting phase.

Risk Controls During Connectivity or Gateway Failures

Q: What are your action plans for order-gateway outages or sudden system/network downtime?

We have a **multi-layer contingency plan** designed to protect open positions and minimize risk:

- **Built-in safety orders:** Every trade automatically includes a take-profit and stop-loss that live on the exchange's own servers. This means any active positions stay protected even if our system goes offline.
- **Automatic cancellation on disconnect:** If our connection drops, the exchange can automatically cancel any unprotected orders to avoid unintended trades.
- **Backup connection:** We keep a secondary order route ready so we can switch instantly if the main one fails.
- **Automatic “safe mode”:** If our system detects a problem, it stops opening new trades and focuses only on managing or closing existing ones.
- **Close positions if needed:** If both main and backup routes fail, we close all open trades as soon as a connection is available.
- **Independent monitoring:** A separate “watchdog” system constantly checks that everything is working and triggers the safety plan if it's not.

Risk Management I

Key Risk Mitigation Strategies

- Advanced algorithmic controls to proactively manage risk
- Real-time monitoring across all trading activities
- Multi-layered security infrastructure safeguarding operations

Compliance Framework

- Full regulatory compliance across jurisdiction
- Ongoing audits and transparent reporting
- Professional-grade custody and asset protection solutions

Risk Management II

Mitigating Reverse Engineering

- Multiple trading accounts across different exchanges
- Randomized order execution: variable delays, position sized, and splitting large trades
- Masking strategies: bots executing decoy trades to generate noise
- Random number parameters enhancing multi-bot variability

Preventing Code Leakage

- Secure API and trading bot communications
- Continuous network monitoring for suspicious activity
- End-to-end encryption of all classes, functions, and variables
- Private networking with trusted servers

Does it work with individual stocks?

Is it only for BTC?

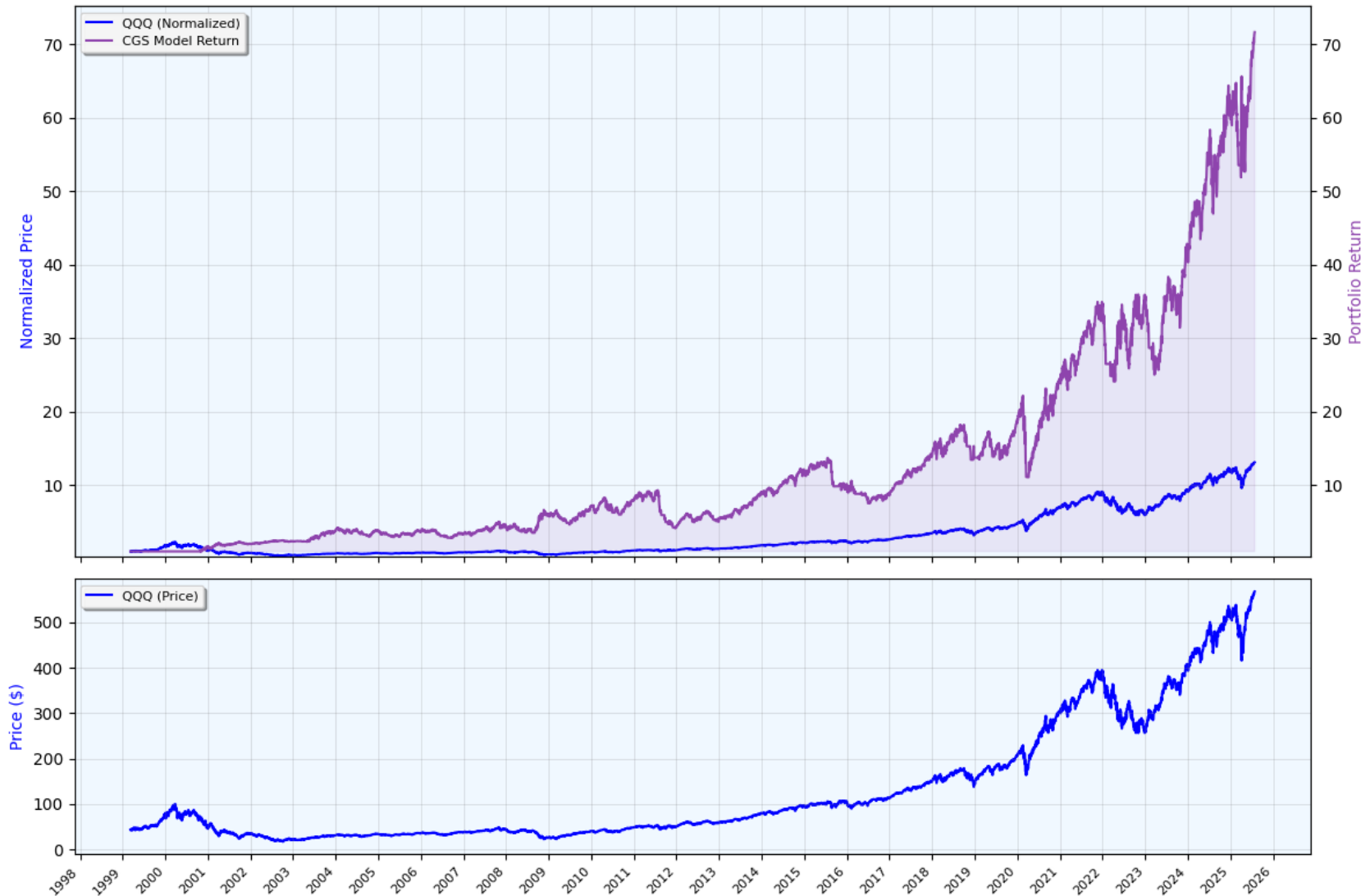
- Definitely not. Our model isn't limited to a single asset class. It's designed to work with any time-series data. It performs just as well whether it's stocks, ETFs, or even entirely different domains.
- Right-hand-side is the performance of the CGS model on **GE (General Electric)**.
- **GE's stock went nowhere with CAGR (+)0.32%, but our model delivers over 10X returns with CAGR (+)9.99%**



Does it work with Nasdaq ETF (QQQ)?

Is it only for BTC?

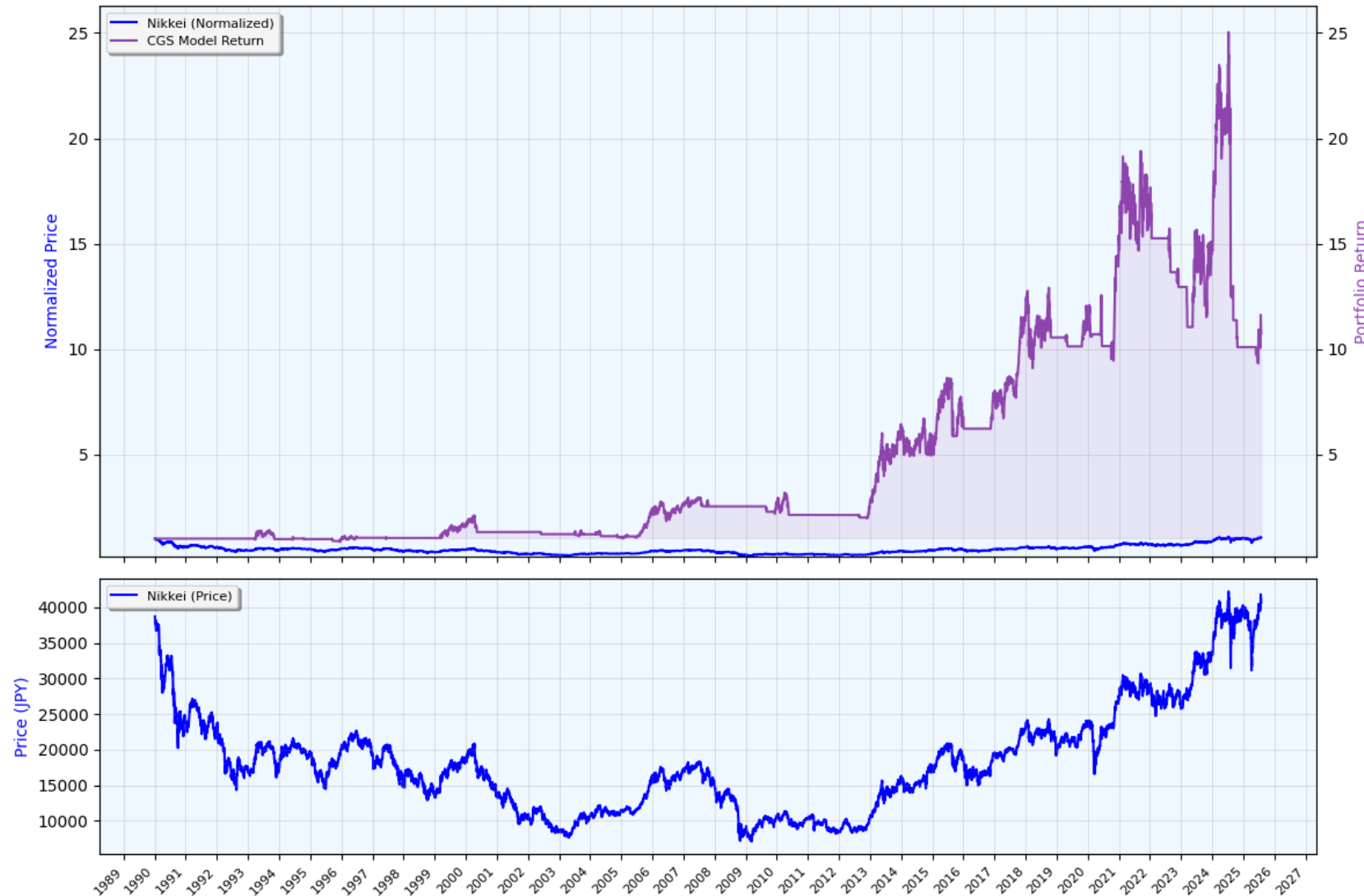
- Definitely not. Our model isn't limited to a single asset class. It's designed to work with any time-series data. It performs just as well whether it's stocks, ETFs, or even entirely different domains.
- Right-hand-side is the performance of the CGS model on **Nasdaq ETF (QQQ)**.
- **Even with QQQ posting a strong 10X return with CAGR (+) 10.06%, our model outperformed with over 70X with CAGR (+) 18.67%.**



Does it work with Nikkei?

Is it only for BTC?

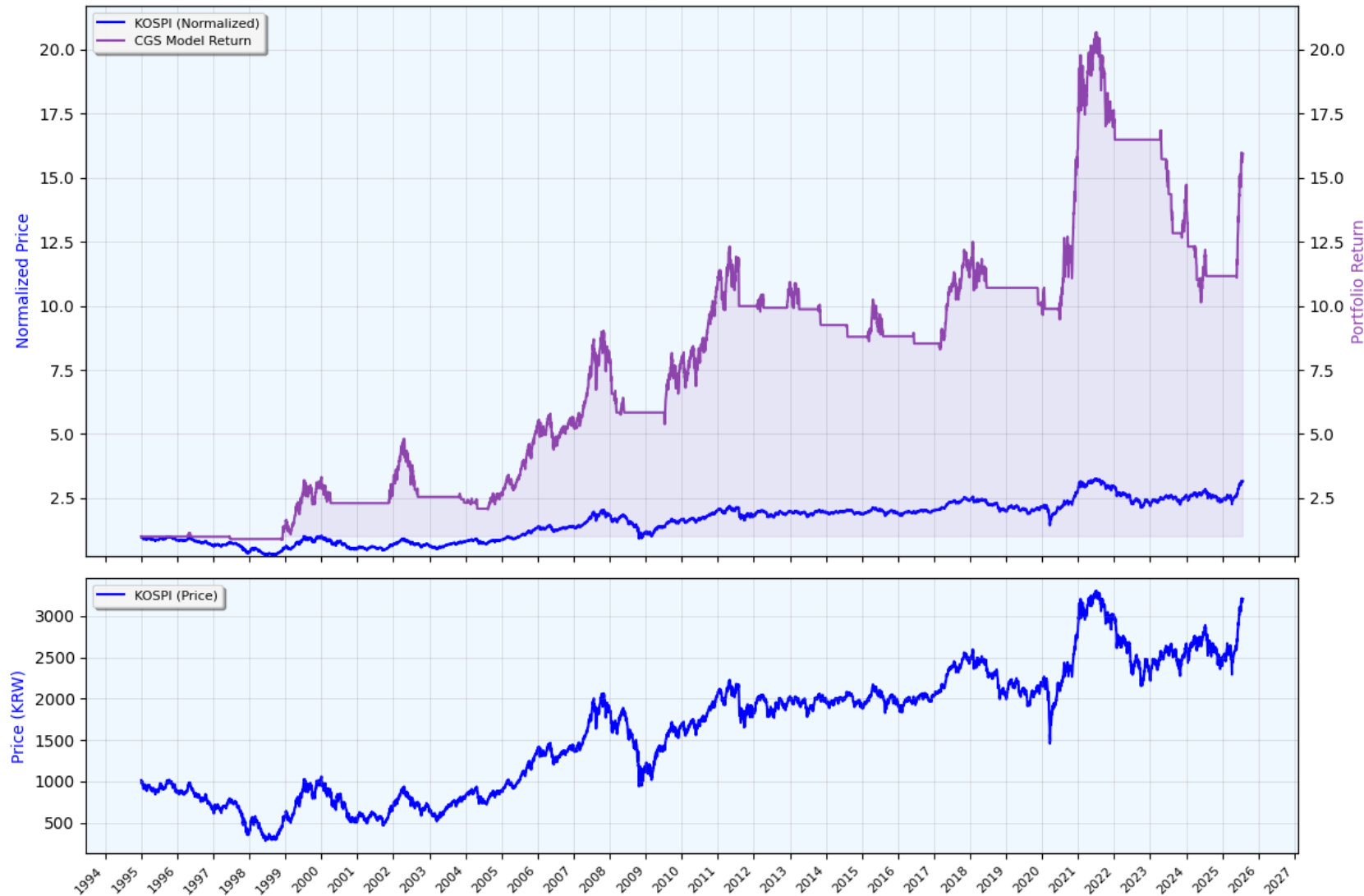
- Definitely not. Our model isn't limited to a single asset class. It's designed to work with any time-series data. It performs just as well whether it's stocks, ETFs, or even entirely different domains.
- Right-hand-side is the performance of the CGS model on **Nikkei 225**.
- Our model outperformed with **CAGR (+)7.09%** while Nikkei 225 side-walked with **CAGR (+)0.08%**.



Does it work with KOSPI?

Is it only for BTC?

- Definitely not. Our model isn't limited to a single asset class. It's designed to work with any time-series data. It performs just as well whether it's stocks, ETFs, or even entirely different domains.
- Right-hand-side is the performance of the CGS model on **KOSPI**.
- Our model returns CAGR (+)9.90% regardless of whether KOSPI moving sideways with CAGR (+)3.84%.



Additional Features

Next-gen Quant-AI Trading Framework

An adaptive architecture fusing AI innovation with quantitative analysis

- Robot Army Execution Engine: Each AI bot runs a unique strategy – conservative, aggressive, mixed – tuned to different market noise profiles.
- Together they form a true portfolio of behaviorally diverse strategies

Human-AI collaboration with XAI-driven Insights

True Human-AI collaboration

- Human design and direct; AI bots execute.
- No blind training unlike most AI quant teams relying on black-box models. Just smart math and clear logic.
- We work with the AI, understand every decision and deploy with confidence

Additional Features

Intelligent Strategy Validation

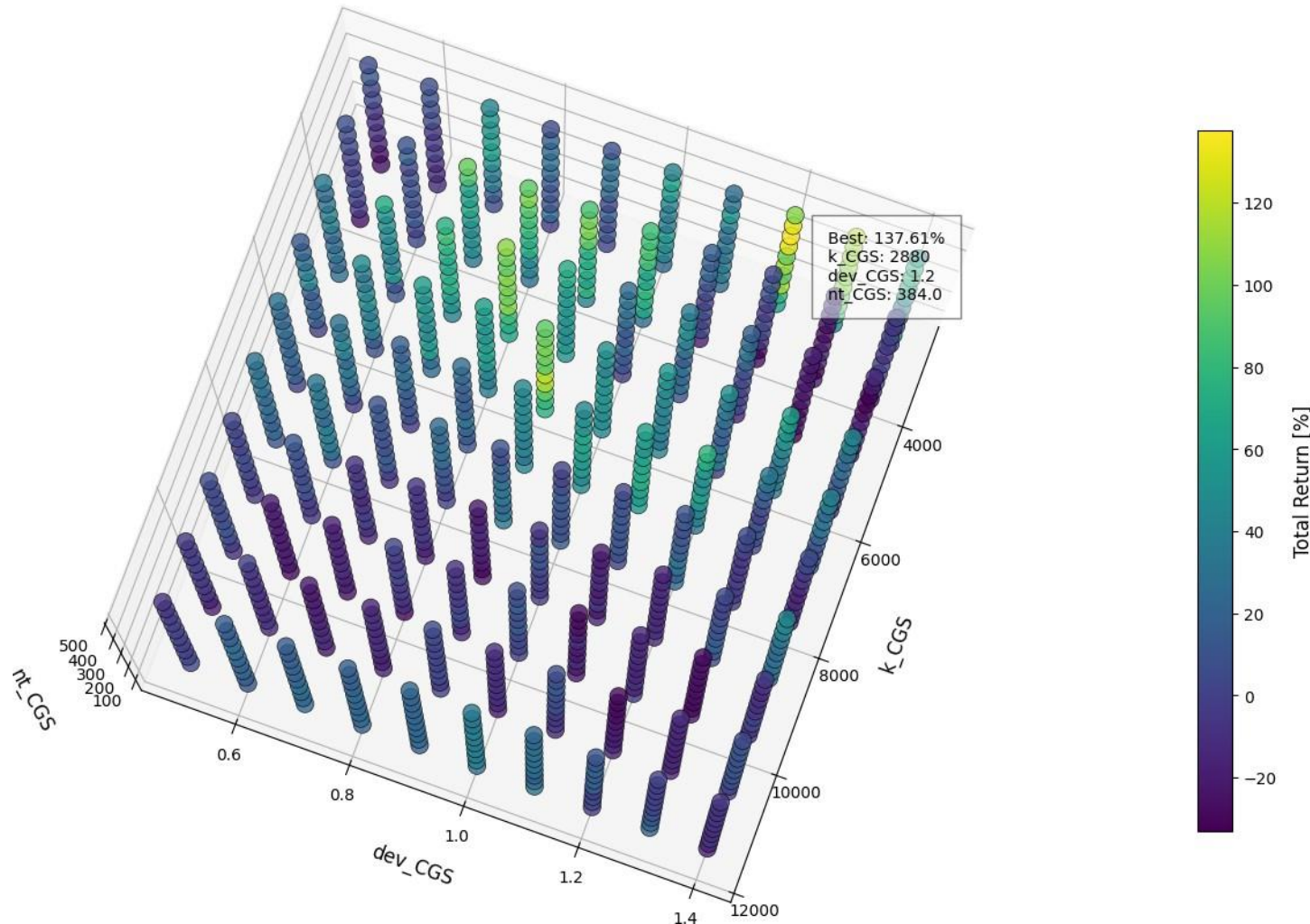
- AI-Powered high-resolution market simulation: Machine learning, pattern recognition and XAI for transparent and high-fidelity strategy evaluation
- Contest-Aware Analysis: Classification of market regimes and scenarios

Risk & Performance Management

- Adaptive Risk Intelligence: ML-driven dynamic risk assessment and position sizing
- AI-Driven Optimization: Continuous strategy tuning via reinforcement learning and predictive models

Data Validations with AI

Parameter Optimization Results



CGS Data Validation AI pack (A) - Interrelation analysis on robot-trader features value and market data

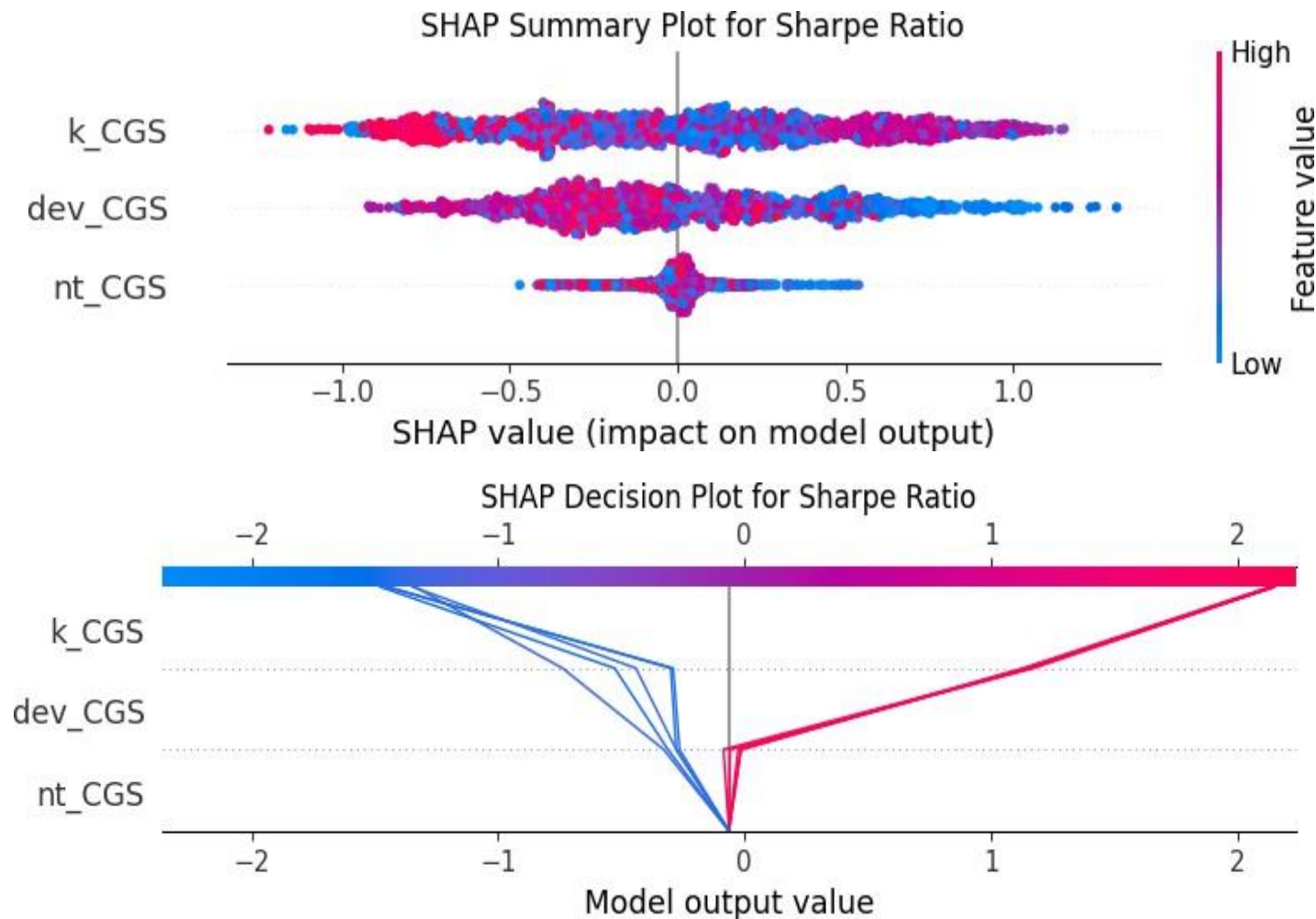
- We generate each bot's traits in a neutral manner and then verify that these settings remain grounded in market reality.
- The x-, y- and z-axes each encode parameters representing individual bots' features.
- By visualizing this as a heat map, we can check whether we're effectively capturing the market's underlying dynamics.

Data Validations with AI

The CGS framework uses Explainable AI (XAI) to analyze parameter combination, ensuring strategies remain robust and transparent across real-market simulation and live trading.

- Prevent Overfitting: Distinguish change from genuine patterns
- Parameter Sensitivity: Gauge performance impact of parameter changes
- Optimization Guidance: Prioritize tuning of critical parameters
- Transparency: Clarify why certain combinations excel
- Adaptability: Adjust parameters as market conditions evolve

Data Validations with AI

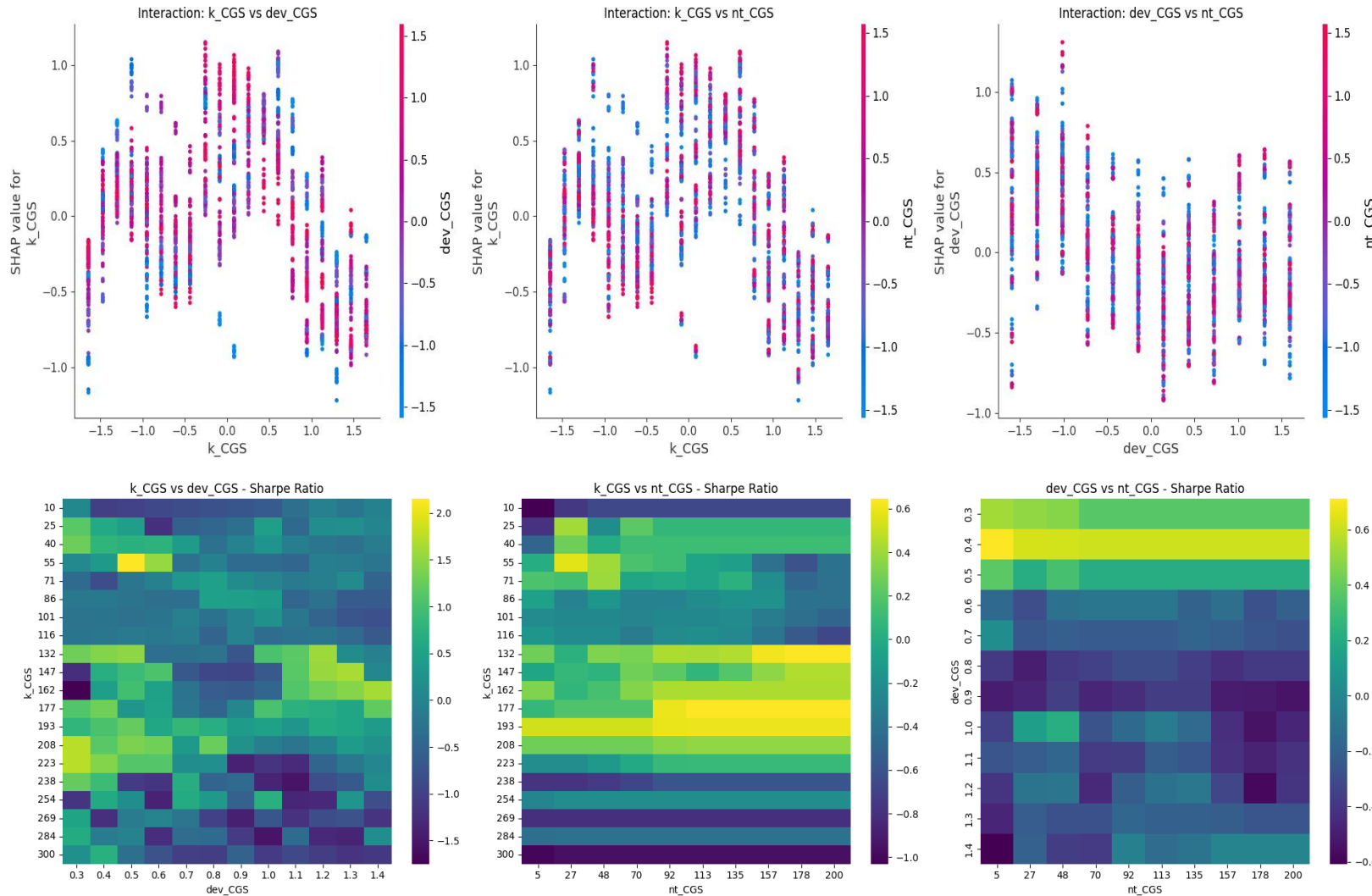


CGS Data Validation AI Pack (B) - Impact analysis on robot-trader parameter and CGS performance output data

- Validation on each bot's settings to be grounded in market reality from the different angle.
- “`k_CGS`”, “`dev_CGS`” and “`nt_CGS`” in the left chart represent each of parameters, defining each bot's trading tendency features.
- Heatmaps show contribution of each parameter to trading output.

Data Validations with AI

Understanding how parameter interact is crucial.



CGS Data Validation AI Pack (C) - Interaction analysis on robot-trader parameter distributions and combinations

- Heatmaps show contribution of distribution and combination of robot-parameters to trading output.

Your Questions, Answered

Q1. There are many firms claiming to do algorithmic trading. How are you different? What makes you unique?

While most AI quant teams rely on black-box models, we, as quants and system architects, built trading system for full transparency and control so that we understand exactly how it works and why it behaves the way it does. **Simple, yet powerful: We design; AI bots execute.**

- **Explainable decision making**
 - Our approach is rooted in pure mathematics-based analysis of raw prices and time series data.
 - Using a universal, asset- and frequency-neutral framework, we ensure that every trading decision is logical, transparent, and fully explainable – again, never a black box.
- **Built on pure math. Focused, low-frequency execution**
 - We intentionally avoid high-frequency noise and fragile short-term signals.
 - We use robust noise filtering and signal-amplifying logics – engineered to extract meaningful market dynamics and deliver stable, explainable performance over time.

Your Questions, Answered

Q2. Why seek investment when you already perform well?

We believe that our trading engine will fundamentally disrupt the market. **The strategy works, the infrastructure is built. The engine is up and running. The track record is real.** Now, let's consider the most rational decisions a person could make:

- Option 1: Stay as an **individual trader** and earn a **modest side income**.
- Option 2: Build a **hedge fund company** capable of **generating exceptional, institutional-level returns**.

Option 1 is the safer choice– but it offers limited upside potential. The same level of income could likely be earned by simply working harder at our current jobs. Option 2 requires deep commitment and focus, but it's the most compelling path for a serious entrepreneur.

We are creating what we believe could become the most successful hedge fund in history – one that aims to outperform Renaissance Technologies. We are seeking investors who have the vision to recognize this potential and join us on the ground floor. Together, we can craft something special that has the power to reshape the future of finance.

Your Questions, Answered

Q3. If I invest, how will the funds actually be managed, allocated, and returned?

- We are seeking investors with a minimum two-year commitment, targeting a four-year investment horizon, which aligns with the global M2 liquidity cycle. While we encourage long-term commitment, capital withdrawals will be permitted after the initial two-year lock-up period.
- **Investment Vehicles:** The capital will be deployed through investment vehicles in the Cayman Islands and Hong Kong. Investors can participate as shareholders in these entities, operating as proprietary investment companies. At the end of the investment period – or upon early redemption after the lock-up – investors will receive their principal along with any realized returns.
- **R&D Entity:** Separately, we are also raising equity for our R&D entity, which owns the core trading system. This entity licenses the system to the investment vehicles, generating recurring fee income. Structurally, the R&D entity will function as the parent company, while the investment vehicles will operate as execution arms, supporting scalability, IP protection, and long-term value creation.

Your Questions, Answered

Q4. Looks like your strategies have done great with a few hundred thousand dollars so far. But as you scale up, how do you make sure the core assumptions – like expected returns – still hold up?

- We allocate seed capital to a large number of autonomous trading bots – ranging from at least 288 to as many as 5,000 – even when operating on the same underlying asset. Each bot is assigned to a distinct set of features and parameters, effectively creating a portfolio diversification within a single asset class. The bots differ in entry timing and directional bias (long or short), while actual execution is centralized through a master manager bot that submits only the net synthetic positions.
- This multi-bot architecture enables micro-fragmented trade entries across a broad time spectrum, thereby minimizing slippage. It also replicates the benefits of portfolio diversification without requiring multiple asset classes.
- As a result, even after accounting for transaction costs – including slippage and fees – this structure remains mathematically scalable and capable of maintaining comparable performance levels with no degradation in efficiency, even up to several billion dollars under management.

Your Questions, Answered

Q5. Why did you guys start with BTC?

- First, the Bitcoin market operates 24/7, offering significantly more trading opportunities.
 - **Traditional stock markets:** 6.5 hours/day, 252 days/year → about **16,380** hours over 10 years
 - **Bitcoin market:** 24 hours/day, 365 days/year → about **17,520** hours over 10 years
 - This means **2 years of BTC trading time exceeds 10 years of stock market hours.**
- Second, BTC is one of the most challenging markets to trade due to its higher volatility, rapid market shifts.
 - Our reasoning is simple: If a model consistently performs in the BTC market, it should perform even better in more stable and structured markets.
 - This is why: **Not because it's easy, but because it's hard.**

Your Questions, Answered

Q6. Do you have plans to expand to other financial markets?

Absolutely.

- **The U.S. stock markets are on the verge of moving towards 24-hour trading, and that's going to change the game.**
- **Once the U.S goes fully 24 hours of trading, other global markets will follow.**
- We believe that this marks the return (or a new era) of quants and systematics trading – a shift back to fast, data-driven strategies.
- And yes, we're fully prepared to expand into those markets as they evolve.

Your Questions, Answered

Q7. Are there risks if the two co-founders have disagreements or part ways?

We understand this is an important concern for investors and business partners, especially since both co-founders have full knowledge of our proprietary algorithms and trading strategies. We have addressed this risk with strict, lifetime legal agreements:

- **Lifetime non-compete & non-disclosure:** Both co-founders are permanently prohibited from working in any competing or related business, anywhere in the world.
- **Equal stake & aligned incentives:** The two co-founders share profits 50-50, ensuring both are equally motivated toward the company's success.
- **Binding mutual agreement:** This restriction is part of a formal, enforceable agreement between the co-founders, in addition to standard corporate protections.
- **Secure systems & shared control:** Access to code, data, and operational systems is structured so no single co-founder can operate the business independently.
- **Long-term alignment:** The co-founders have a proven track record of collaboration and share the same strategic and financial goals.

Investment Proposal

CGS Engine Quants

CGS offers Institutional Grade Investment Products

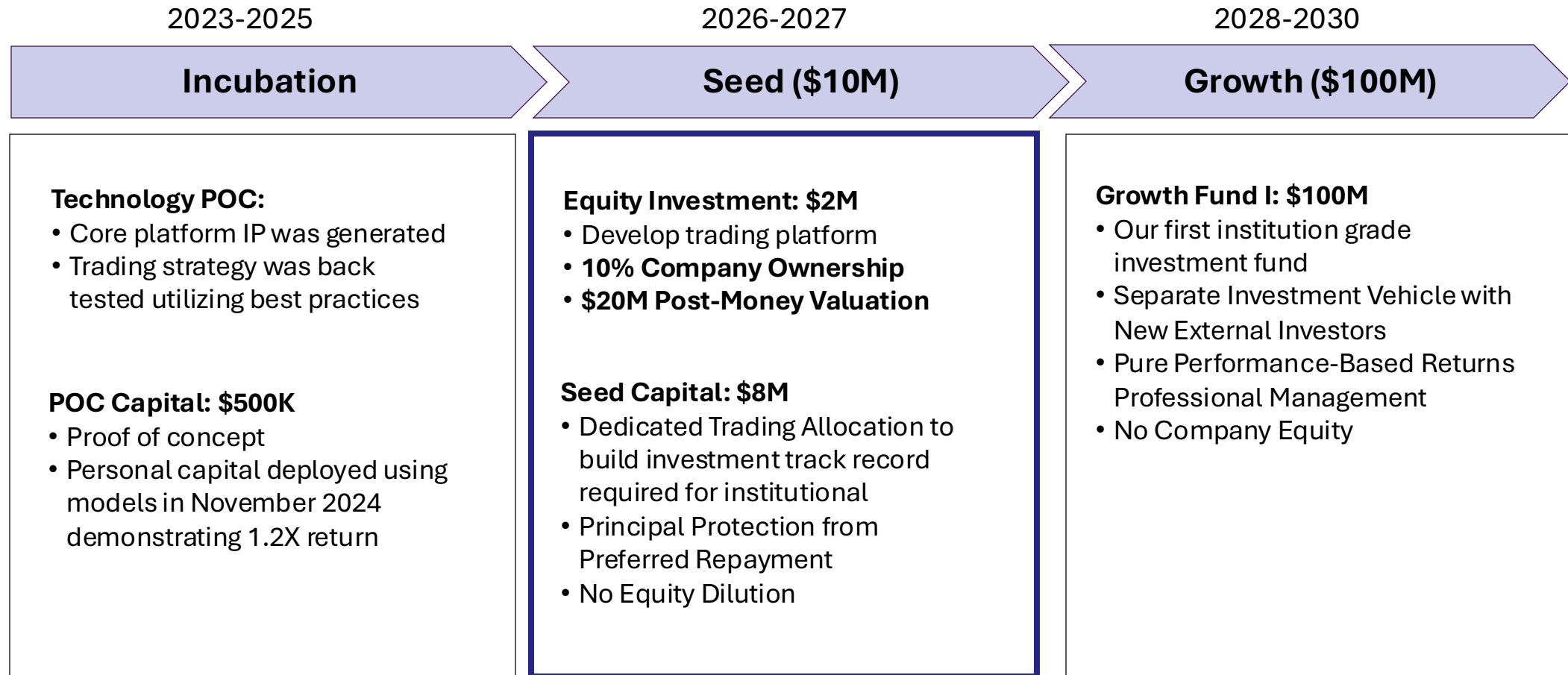
Revenue streams across multiple value generation channels

- Performance fees
- Management fees
- Potential fund expansion
- Technology licensing
- Equity appreciation

Go to market roadmap

- 2025: Incubate platform
- 2026-2027: Seed Fund
- 2027-2030: Growth Fund I
- Beyond: Additional Fund

Seed investment provides potential for strong returns

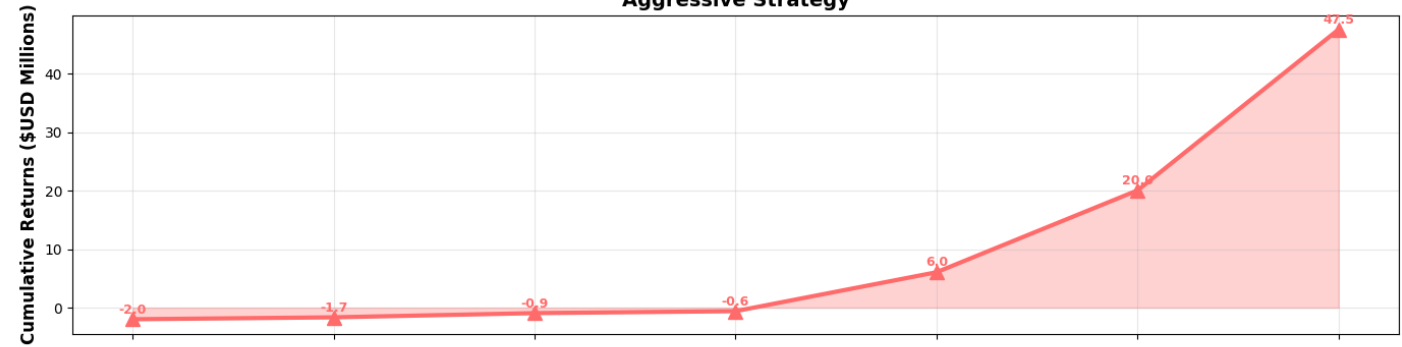


Potential for \$350M Enterprise Value from \$10M seed in 5yrs.

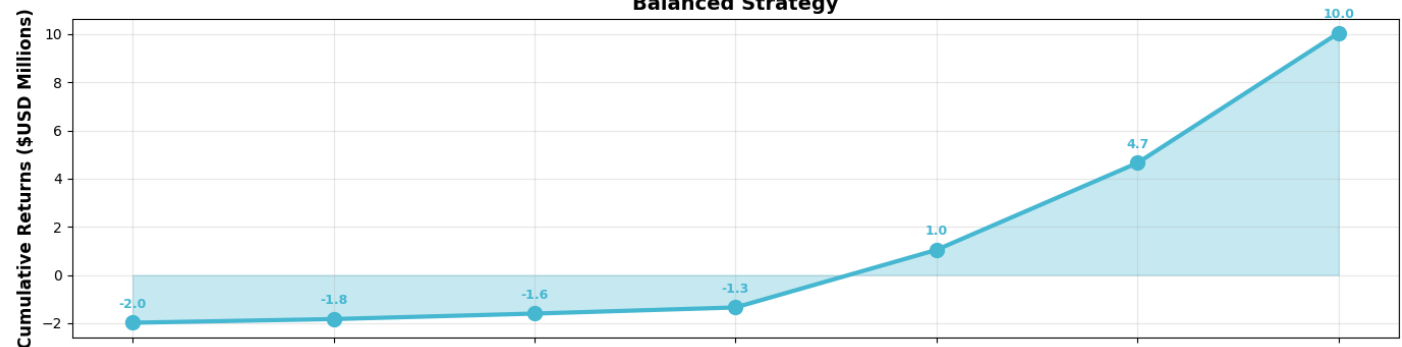
Note: prospective financial model can be shared

Cash Flow Projection - Holdco Equity

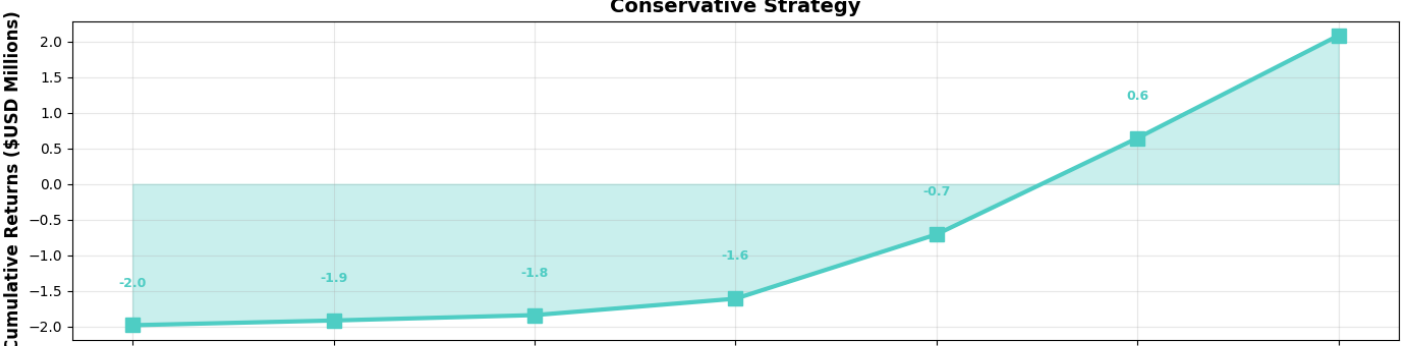
Equity Investor Returns Comparison
(\$2M Investment for 10% Equity)
Aggressive Strategy



Balanced Strategy



Conservative Strategy



=== ANNUAL FEE INCOME PROJECTION ===

Year	Balanced	Conservative	Aggressive
2025	0.2M	0.2M	0.2M
2026	1.5M	0.7M	2.6M
2027	2.3M	0.9M	6.0M
2028	2.5M	2.3M	3.2M
2029	23.9M	9.2M	59.2M
2030	36.1M	13.0M	131.1M
2031	53.9M	15.1M	238.6M

=== EQUITY INVESTOR RETURNS ===

Year	Balanced	Conservative	Aggressive
2025	-2.0M	-2.0M	-2.0M
2026	0.2M	0.1M	0.3M
2027	0.2M	0.1M	0.6M
2028	0.3M	0.2M	0.3M
2029	2.4M	0.9M	5.9M
2030	3.6M	1.3M	13.1M
2031	5.4M	1.5M	23.9M

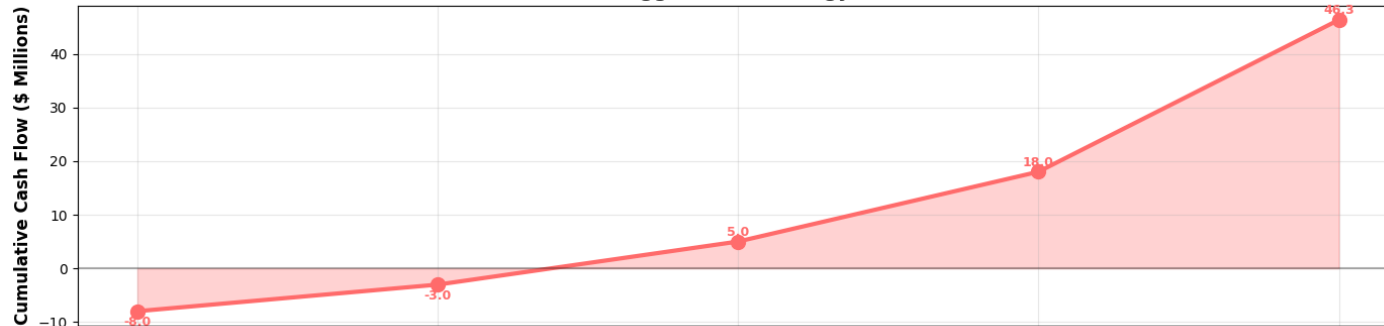
=== CUMULATIVE EQUITY RETURNS (2025-2031) ===

Strategy	Total Return	ROI
Balanced	10.0M	602.3%
Conservative	2.1M	206.4%
Aggressive	42.1M	2204.1%

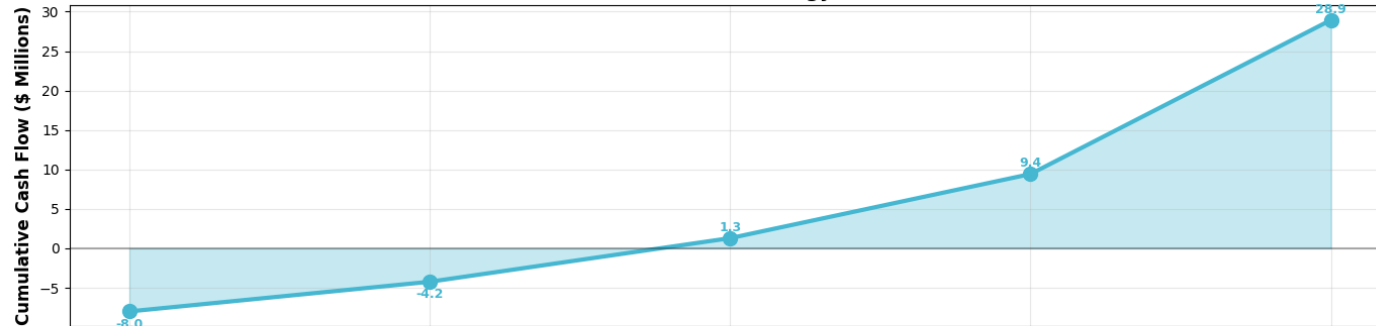
The above projection assumes market conditions similar to recent years and is provided for illustrative purposes only.

Cash Flow Projection - Trading Seed

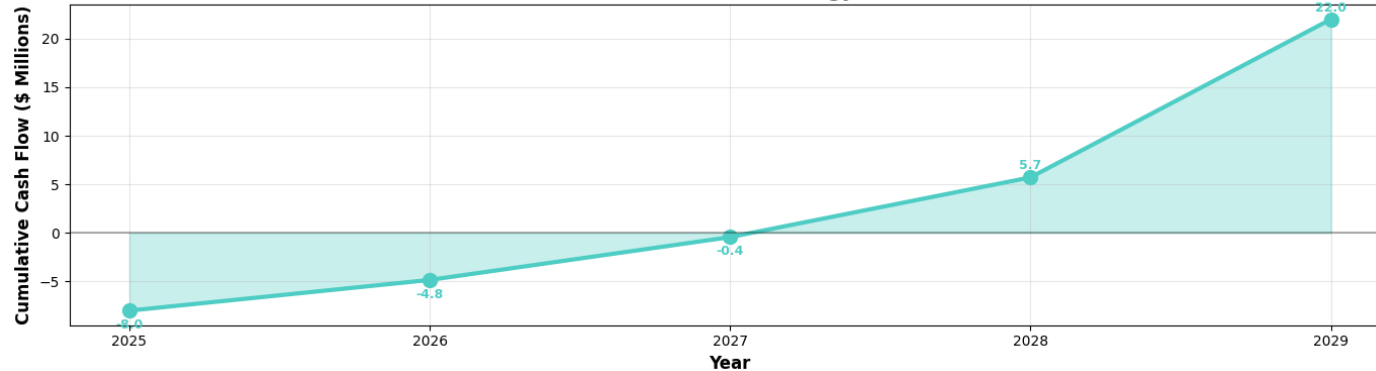
Seed Fund Investor Cash Flow Analysis (2025-2029)
(\$8M Initial Investment)
Aggressive Strategy



Balanced Strategy



Conservative Strategy



AGGRESSIVE STRATEGY:

Initial Investment: \$8.0M

Final Portfolio Value: \$54.3M

Total Return: \$46.3M

ROI: 579.3%

Annual Cash Flows (Seed Fund Period):

2025: \$-8.0M (Initial Investment)

2026: \$+5.0M

2027: \$+8.0M

2028: \$+13.0M

2029: \$+28.3M (Return + Principal)

BALANCED STRATEGY:

Initial Investment: \$8.0M

Final Portfolio Value: \$36.9M

Total Return: \$28.9M

ROI: 361.7%

Annual Cash Flows (Seed Fund Period):

2025: \$-8.0M (Initial Investment)

2026: \$+3.8M

2027: \$+5.5M

2028: \$+8.1M

2029: \$+19.5M (Return + Principal)

The above projection assumes market conditions similar to recent years and is provided for illustrative purposes only.

Thank you

Let's keep in touch!

The strategy works, The infrastructure is built. The engine is up and running. The track record is real. This isn't just a capital raise – it's partnership opportunity to scale a proven system together.

Email us at contact@cgstech.co

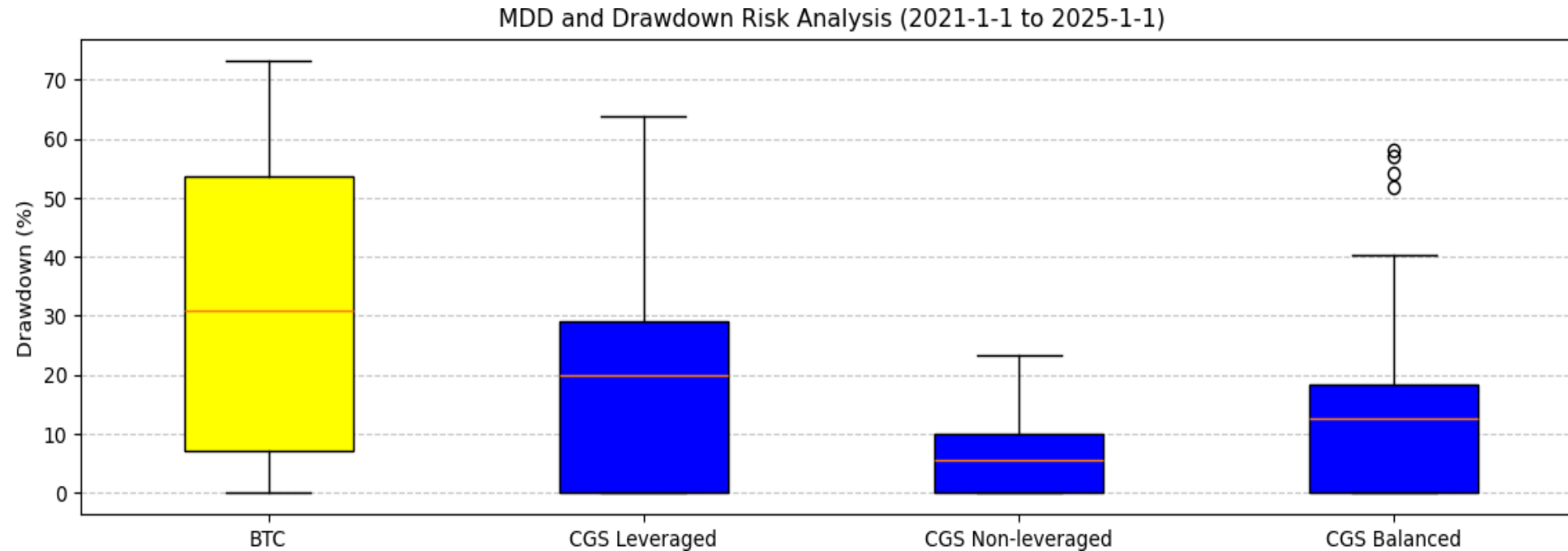
Join us in shaping the future

- **Schedule a detailed discussion**
- **Review complete investment documentation**

Annex

CGS Engine Quants

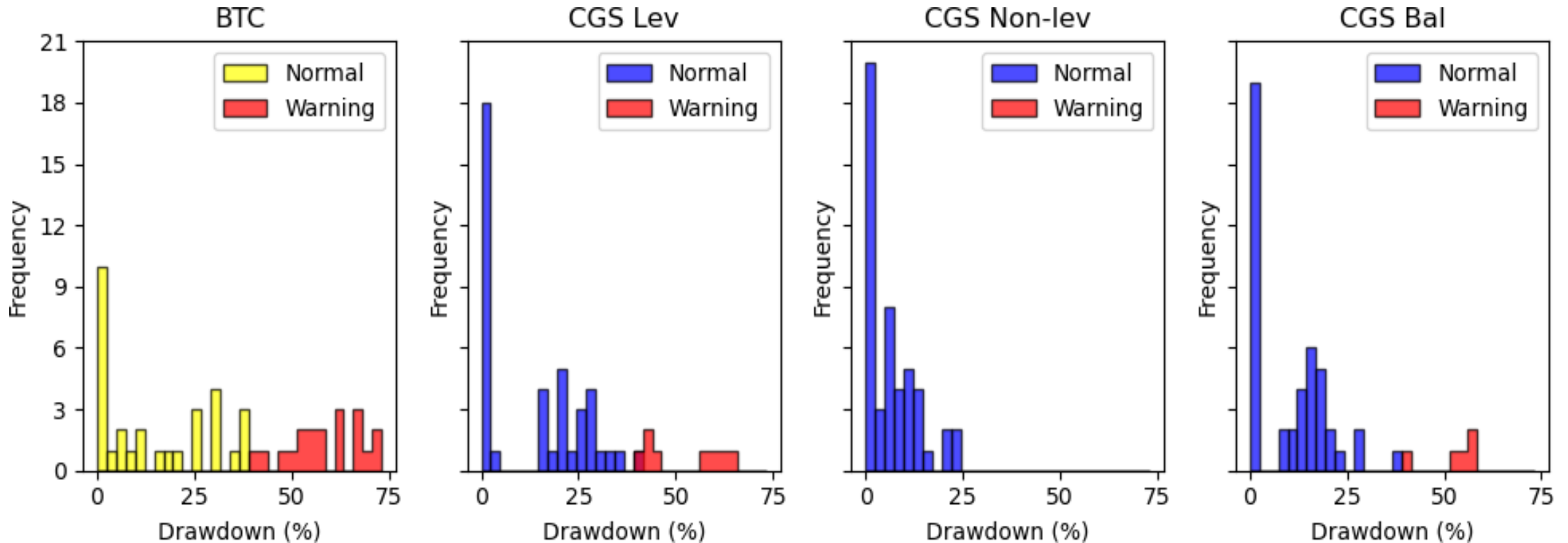
Maximum Drawdown (MDD) and Risk Analysis



	MDD (%)	Mean (%)	Median (%)	Std Dev (%)	Max Recovery Time
BTC	73.18	32.01	30.84	24.83	28
Lev	63.94	19.39	19.84	19.10	9
Non-lev	23.39	6.32	5.65	6.71	7
Bal	58.05	14.34	12.68	16.08	9

Smaller drawdowns and faster recoveries!!

Drawdown distribution comparison



A passive BTC holding results in the most frequent and severe drawdowns (highest MDD) while also requiring the longest recovery time.

Drawdown Metrics, Explained

- **Smaller drawdowns and MDD, together with faster recoveries: less time in loss, better risk management, more robust trading strategy**
- **Drawdown: How much an investment falls from its most recent highest value.**
 - If your account grows to \$100 and then drops to \$70, then the drawdown is 30%
- **Maximum Drawdown (MDD): The worst drawdown during a period.**
 - The biggest drop from a peak (the highest value) to the bottom (the lowest value before recovery)
- **Recovery: How long it takes to climb back from a loss to its previous highest value.**
 - If your account grows to \$100 and then drops to \$70, and it took 3 months to get back to \$100, the recovery time is 3 months.

Key Takeaways

Based on the data:

- **BTC passive holding: Huge drops with very long recovery time**
- **All three CGS strategies: Much smaller drops with significantly quicker recoveries**

Sharpe Ratio, ROI and Volatility Comparison

		2021	2022	2023	2024	Cumul. ¹
Sharpe Ratio ²	CGS Lev.	2.55	-0.29	5.29	1.27	2.65
	CGS Bal.	2.25	-0.17	3.88	1.32	3.29
	CGS Non-lev.	1.93	-0.01	2.29	1.34	2.59
	BTC	0.62	-1.01	3.20	2.04	0.87
ROI(%)	CGS Lev.	414.85	-36.66	729.68	183.74	196.86
	CGS Bal.	213.60	-6.27	258.99	96.16	125.58
	CGS Non-lev.	146.51	3.85	102.09	66.97	71.44
	BTC	60.53	-64.31	156.18	119.95	34.00
Vol(%)	CGS Lev.	162.43	141.59	137.05	141.40	72.98
	CGS Bal.	94.84	62.56	65.47	69.52	37.10
	CGS Non-lev.	75.76	36.72	42.26	46.88	26.31
	BTC	97.44	68.21	47.19	56.68	34.99

¹ Annualized cumulative values

² The average 3-month Treasury bill rates (for the risk-free rate) are: approx. 0.05% in 2021, approx. 4.25% in 2022, approx. 5.24% in 2023, approx. 4.27% in 2024; and the annualized cumulative risk-free rate is 3.39%.

Sharpe and Sortino Ratios with Downside Deviation

	2021		2022		2023		2024	
	Sharpe	Sortino	Sharpe	Sortino	Sharpe	Sortino	Sharpe	Sortino
CGS Lev	2.55	10.59	-0.29	-1.17	5.29	19.07	1.27	6.17
CGS Bal	2.25	8.22	-0.17	-0.47	3.88	10.97	1.32	3.64
CGS N-lev	1.93	14.67	-0.01	-0.03	2.29	8.01	1.34	7.00
BTC	0.62	1.31	-1.01	-2.08	3.20	12.53	2.04	8.30
	σ	σ_d	σ	σ_d	σ	σ_d	σ	σ_d
CGS Lev	1.62	0.39	1.42	0.35	1.37	0.38	1.41	0.29
CGS Bal	0.95	0.26	0.62	0.22	0.65	0.23	0.69	0.25
CGS N-lev	0.76	0.10	0.37	0.11	0.42	0.11	0.47	0.09
BTC	0.97	0.46	0.68	0.33	0.47	0.12	0.57	0.14

Sharpe and Sortino Ratios, Explained

- **Sharpe ratios over 1 are considered good; Sortino ratios over 2 are considered strong.**
- **Sharpe Ratio**
 - How much extra return you get for every unit of total risk (both upside and downside)
 - Formula = $(ROI - \text{risk-free rate}) / \text{standard deviation of returns}$
 - Counts all volatility (both upside and downside)
- **Sortino Ratio**
 - How much extra return you get for every unit of “bad” risk (downside only)
 - Formula = $(ROI - \text{risk-free rate}) / \text{downside deviation of returns}$
 - Counts only downside (below risk-free rate)

Key Takeaways

Based on the data:

- **Consistently higher Sharpe & Sortino than passive BTC: Stronger Returns, Lower Risk**
- **Up to 10x better downside protection** than passive BTC holding