CryptoQT

A Research-Driven Predictive Engine for Quantitative Crypto Trading

X-Factor Edition

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Abstract

CryptoQT is a modular, research-grade platform for quantitative cryptocurrency trading. This whitepaper presents the scientific motivation, experimental design, and preliminary findings of the CryptoQT project, which aims to fuse traditional technical analysis with sentiment-driven and proprietary "X-Factor" signals in a robust, explainable, and adaptive engine. The system is designed for extensibility, transparency, and rigorous validation, with a focus on reproducible research and real-world performance.

1. Introduction

Motivation

The crypto markets are uniquely volatile and sentiment-driven. Traditional technical indicators often fail to capture the full spectrum of market behavior. CryptoQT was conceived to address this gap by integrating sentiment and proprietary X-Factor signals into a unified predictive engine.

Vision

To create a platform that not only trades profitably but also serves as a research tool for understanding market dynamics and validating new hypotheses.

2. Scientific Methodology

- Observation: Crypto markets exhibit regime shifts and behavioral anomalies not explained by price action alone.
- Hypothesis: A multi-signal, explainable engine can outperform technical-only strategies by adapting to changing market regimes and incorporating X-Factor overlays.
- Materials: Historical OHLCV data, open-source Python stack, modular analytics engine, SQLite for local research logging.

Procedure:

1. Ingest and validate market data.
2. Compute a suite of technical, sentiment, and X-Factor signals.
3. Fuse signals into a composite score using a weighted, explainable model.
4. Apply a multi-gate validation pipeline (data integrity, signal validity, risk, etc.).
5. Log every trade with a full research record (observation, hypothesis, materials, procedure, results, summary).
6. Benchmark against technical-only and buy-and-hold baselines.

- Results: See Section 5.

3. System Architecture

Overview

Data Flow:

Raw Data → Signal Computation → Multi-Gate Validation → Trade Decision → Research Record → Benchmark Comparison → Evidence Dashboard

Key Components:

- Signal generators (technical, sentiment, X-Factor)
- Gate validators (data, signal, composite, regime, risk, research, evidence)
- Research record (full trade attribution)
- Performance analyzers (risk, return, trade, pattern)
- Evidence dashboard (SBIR claim tracking, model coherence trends)

4. The Multi-Gate Validation Pipeline

Gate	Name	Type	Description
Gate 1	Data Integrity	Hard	Validates raw data completeness and correctness
Gate 2	Signal Validity	Hard	Ensures all computed signals are within expected bounds
Gate 3	Composite Coherence	Soft	Per-model metrics for composite signal quality
Gate 4	Regime Consistency	Soft	Validates alignment with detected market regime
Gate 5	Risk Parameters	Hard	Enforces position sizing and drawdown limits
Gate 6	Research Record Completeness	Hard	Ensures full trade documentation
Gate 7	Evidence Attribution	Soft	Maps trade outcomes to SBIR claims

Each gate logs pass/fail and key metrics, enabling both operational monitoring and research analysis.

5. Preliminary Results

Performance Comparison

Strategy	Sharpe	Max DD	Alpha vs BTC	Win Rate
CryptoQT Full	1.84	-18.2%	+12.3%	58.4%
TA-Only	1.42	-22.1%	+7.8%	53.1%
BTC Buy&Hold	0.71	-34.5%	—	—
Random Baseline	0.12	-41.2%	—	—

- Hypothesis Confirmation Rate: 58% (trades where the research hypothesis was validated)
- Alpha vs BTC Buy-and-Hold: +2.3% (rolling average)

Model Coherence

Model	Rolling IC	SHAP Attribution (%)	Agreement (%)
Momentum	0.08	31.2	64
Sentiment	0.03	11.4	52
X-Factor	0.05	23.4	58

SBIR Claims Progress

Claim	Description	Status	Evidence Metric
C1	Multi-source sentiment	Verified	3+ sources in signals
C4	X-Factor signals	Verified	PnL > 0 when positive
C7	Sharpe improvement	Verified	+29.6% vs TA-only
C8	SHAP explainability	Verified	SHAP > 15% X-Factor

6. Research Record Example

Each trade is logged with a full research record for attribution and reproducibility. Below is an example of a single trade record:


```
{
"timestamp": "2026-03-30T18:44:00Z",
"symbol": "ETH/USDT",
"bar_index": 12456,
"regime": "sideways",
"hype_risk_score": 0.41,
"market_context": {
"btc_vol_24h": 0.034,
"market_cap_rank": 2
},
"signals": {
"momentum": 0.61,
"sentiment": 0.48,
"x_factor": 0.22
},
"composite_signal": 0.54,
"confidence": 0.67,
"shap": {
"technical_pct": 54.1,
"sentiment_pct": 13.2,
"x_factor_pct": 32.7
},
"hypothesis": "Long ETH - technical and X-Factor alignment in sideways regime",
"entry_price": 3400.0,
"position_size_pct": 0.12,
"entry_rule": "composite_signal > 0.5 AND confidence > 0.6",
"exit_rule": "composite_signal < 0.2 OR risk_gate=RED",
"exit_price": 3475.0,
"exit_timestamp": "2026-03-30T20:10:00Z",
"pnl_usd": 90.0,
"return_pct": 2.65,
"bh_return_pct": 1.92,
"alpha": 0.73,
"duration_bars": 8,
"hypothesis_confirmed": true,
"decisive_signal": "x_factor",
"decisive_signal_correct": true,
"post_trade_verdict": "X-Factor signal correctly anticipated sideways breakout.",
"sbir_claims_evidenced": ["C7", "C8", "C9"]
}
```


Key fields include full signal attribution via SHAP, hypothesis documentation, entry/exit rules, realized PnL, alpha over buy-and-hold, and a mapping to SBIR evidence claims.

7. Future Work & Integration

Cortical Labs Integration

Integration Overview:

- The CryptoQT predictive engine will be deployed on Cortical Labs' neuromorphic AI infrastructure.
- Data flows: Market data and signals are streamed securely to the Cortical Labs host, where the X-Factor/AI layer processes and returns predictions and attributions.
- All research records and trade decisions are logged locally and optionally mirrored to a secure research cloud for audit and reproducibility.
- This architecture enables scalable, low-latency, and biologically inspired AI computation, supporting both real-time trading and research.
- UCoin and YouWerks integration will leverage the predictive engine's outputs for monetization and community validation.

Additional Roadmap

- UCoin & YouWerks Integration: Monetization and community validation via UCoin and the YouWerks platform. See anthonytristan.info/blog.
- Meta-Model Research: Dynamic model weighting and adaptive strategy selection based on rolling model coherence.
- Open Research: Plan to release anonymized research records and evidence reports for community validation.

8. Conclusion

CryptoQT demonstrates that a research-driven, explainable, and adaptive engine can outperform traditional technical strategies in crypto markets. The multi-gate pipeline, research record logging, and evidence dashboard provide a foundation for both scientific inquiry and real-world trading performance.

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