

Fortuna — Lab Review (Labs 1–9A)

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The Big Picture

Fortuna is a regime-conditioned algorithmic trading system for BTC and SOL. The goal: detect what kind of market it is, generate a signal conditioned on that regime, and size positions using both risk and conviction.

Lab Stack

Lab	Name	One-Line Summary
1	Signal in the Noise	Logistic regression on z-score detects Singularistic Events (big upside moves); $z=2-3$ is the sweet spot before smart money front-runs.
2	Three-Strategy Regime	Mapped z-score bands to dead zone / sniper / too-late using EV tables; validated sniper strategy at $z=2-3$.
3	Volume as Leading Indicator	Tested volume as X2 — price is the aftermath, volume is the cause; volume spikes precede the move.
4	Baum HMM Regime Detector	4-state Gaussian HMM (Bull / SoftBull / Choppy / Bear) on BTC candle shape features; produces soft posteriors $\gamma_k(i)$.
5	Regime-Conditioned ML Signal	XGBoost + HMM posteriors as features; Bear avoidance alone = +8.21 Sharpe lift on BTC.
6	SOL Regime Calibration	BTC-trained HMM labelled 78% of SOL as Choppy — fixed with SOL-specific rolling train window + volatility feature.
7	Live Signal Engine + TUI	Cron-scheduled radar emits typed signals to SQLite; Textual dashboard for human-in-the-loop approval.
8	Position Sizing via $\gamma_k(i)$	Tested 5 schemes (flat, Kelly, stepped, hybrid, regime-switch); flat binary wins on trending SOL, Kelly better for capital preservation.
9A	ρ Candidate Analysis	Tested 4 risk parameters; ρ_4 (jump outcome variance) negatively correlates with drawdown — it's a conviction signal, not a risk measure.

Key Findings

ρ_4 is conviction, not danger. When Bull signals fire frequently with dispersed returns, the market is trending — drawdown is low. ρ_4 should be used to *size up*, not size down.

Candidate	Tracks	Use as
ρ_1	Price volatility	Risk floor / Kelly denominator
ρ_2	Volume-weighted volatility	Slightly better risk floor

Candidate	Tracks	Use as
ρ_3	Regime clarity (HMM entropy)	Filter: skip trades when entropy > threshold
ρ_4	Signal momentum / conviction	Size-up signal

Fortuna Stack

Lab 4 → HMM regime states (Bull / SoftBull / Choppy / Bear)
 Lab 5 → XGBoost signal conditioned on regime
 Lab 8 → Kelly position sizing (flat binary baseline)
 Lab 9A → ρ_4 = conviction, not risk
 Lab 9B → Dual-input sizer: ρ_1 (risk floor) $\times$ ρ_4 (conviction scale-up)

Next: Lab 9B

Three design paths:

1. **Invert ρ_4** — use $(1 - \rho_4)$ as risk proxy
2. **Dual-input Kelly** — $\text{size} = f^* \cdot \rho_4$ where f^* is ρ_1 -based Kelly
3. **Regime-gated conviction** — only size up when HMM entropy (ρ_3) is low *and* ρ_4 is high

Path 3 is most principled: the regime must be clear *and* the signal must have a strong recent track record before sizing up.