HALALCRYPTO · RESEARCH

HalalCrypto

A Multi-Agent, Spot-Only, Shariah-Aligned Trading System for Retail Investors — Methodology, Architecture, Governance, and Regulatory Landscape

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ABSTRACT

We present HalalCrypto, a multi-agent automated trading system that lets a Muslim investor expose capital to digital-asset markets without compromising on Shariah requirements. The system pairs a published three-gate screening methodology — anchored on AAOIFI Shariah Standard No. 21, OIC Fiqh Academy Resolution 86/3/D9, and the *Maqasid* framework of *hifz al-mal* — with a spot-only execution layer, six specialised AI agents, and a kill-switch governance design. Funds remain on the user's own exchange account; HalalCrypto holds zero custody. This paper documents the screening methodology in full, derives the agent architecture from first principles, presents synthetic backtest results across three risk tiers, surveys the regulatory landscape across the GCC, Indonesia, Pakistan, Malaysia, and Turkey, and concludes with the governance design (independent oversight board, four-level kill-switch ladder) intended to preserve the system's halal posture under live operating conditions.

Contents

1. Executive Summary

The Muslim investor has, until now, faced a binary choice in digital-asset markets. Either:

1. **Do nothing** and concede the asset class to those without religious constraints, watching wealth-preservation opportunities pass; or
2. **Trade unscreened** through generic exchanges or bots, accepting unknown levels of exposure to *riba* (interest), *gharar* (uncertainty), *maysir* (gambling), and prohibited industries.

Neither option is acceptable in a tradition that holds *hifz al-mal* — the preservation and ethical stewardship of wealth — as a core objective of the Shariah. HalalCrypto exists to dissolve this binary.

This paper documents the methodology, architecture, and governance of HalalCrypto, an automated multi-agent trading system that operates on the user's own exchange account (spot-only, no withdrawal access) and applies a published three-gate screening pipeline derived from AAOIFI Shariah Standard No. 21 to every asset that reaches the order book. The system runs three risk tiers — Conservative, Moderate, and Multi-X — that share an identical halal screening layer but differ in signal aggressiveness, position sizing, and stop-loss tolerance.

Three claims structure the paper:

- **Claim 1 — Halal compatibility.** A Shariah-aligned automated trading system can be built without compromising either the religious requirement or the engineering integrity of the system. Sections 3 and 4 derive the screening rules from primary fiqh sources and document each in operational form.
- **Claim 2 — Architectural sufficiency.** Six specialist agents — Signal Engine, Halal Filter, Risk Engine, Sanctions Screen, Execution Layer, and Observability — are sufficient to replicate the decision quality of a small institutional trading desk while remaining auditable and deterministic. Sections 5 and 6 describe the agent contracts.
- **Claim 3 — Governable risk.** Spot-only execution, kill-switch governance, and an independent oversight board reduce the operational risk surface to a level compatible with retail investor protection. Sections 8 and 10 describe the governance design and limit posture.

We make no fatwa claim. The methodology here is an *operational framework*, not a religious ruling. We invite scrutiny from qualified scholars and publish the outcome of every formal challenge.

2. Thesis

2.1 The problem

Cryptocurrency markets are open 24/7 across more than a hundred jurisdictions. Their volatility offers opportunity but it punishes anything that resembles *gharar* — the contractual uncertainty that the Shariah prohibits. The retail Muslim investor, faced with these markets, encounters three structural problems simultaneously.

Problem 1 — Screening is hard. A correctly screened halal universe requires reading every protocol's tokenomics, treasury composition, governance powers, and product mix; cross-referencing against AAOIFI's published standards and the Fiqh Academy's resolutions; and re-screening every quarter as protocols evolve. No retail investor has time to do this for the 200+ assets they might plausibly want to consider.

Problem 2 — Execution is fast. The signals that drive 24-hour returns in crypto are computed in milliseconds. A human trader cannot intercept them. The investor who screens by hand has already missed the window. The investor who automates execution without a halal layer accepts whatever assets the bot's signals produce — including the majority that will fail any reasonable Shariah screen.

Problem 3 — Custody is risky. Centralised "halal investing" platforms ask the user to deposit funds. The user's funds then sit on the platform's balance sheet; when the platform fails (FTX, Celsius, BlockFi), the user's halal-marketed assets vanish alongside the unscreened ones. The custody risk is a *gharar* of its own kind, on top of the asset-level *gharar* the user was already trying to avoid.

2.2 The solution

HalalCrypto pairs three structural choices that, together, address the three problems:

Problem	HalalCrypto's response
Screening is hard	Three-gate screening, applied to every asset before it reaches the order book; published criteria; quarterly re-review.
Execution is fast	Six-agent automated pipeline; signals computed in seconds; execution gated by the halal filter, not after.
Custody is risky	Non-custodial — the user's API key has spot-trade and read-only permission; withdrawal is verified absent before the key is accepted. Funds remain on the user's exchange account.

The combination matters. Removing any one of the three undoes the system: an automated bot with custody risk has the wrong custody profile; a manually-screened universe with automated execution loses the speed advantage; non-custodial automation without screening replicates the unfiltered-bot problem.

2.3 What this paper is and is not

This paper is an *engineering and methodology document*. It documents what the system does, why each design choice was made, and what limits constrain it. It is intended to be auditable by a neutral reader — a scholar, regulator, or technically competent user — who can read primary sources and judge the work on its merits.

This paper is **not** a fatwa. HalalCrypto is not a religious authority and does not issue rulings. We point to primary sources and reason from them in operational terms; the religious judgement is left to the user and the scholars they consult.

This paper is **not** investment advice. Past performance, including the synthetic backtests in Section 7, does not predict future returns. Cryptocurrency carries substantial risk of loss including total loss. The Shariah-screening methodology limits exposure to non-compliant assets but does not reduce market risk.

3. Halal Screening Methodology

The methodology is structured as three sequential gates. Every asset must pass all three, in order, to enter the trading universe. Failure at any gate is permanent until the underlying condition is remediated and verified at the next quarterly review cycle.

The three gates correspond to three categories of Shariah prohibition:

1. **Business Activity Exclusion** — *what the asset is*. Eliminates assets whose underlying economic activity is prohibited.
2. **Financial Ratio Screening** — *how the asset is financed*. Eliminates assets whose financial structure relies on debt beyond a Shariah-permissible threshold.
3. **Trade Execution Compliance** — *how the asset is traded*. Eliminates trade structures that introduce *gharar* or *maysir* at the execution layer.

This three-gate architecture is structurally similar to the equity-screening approach used by Islamic stock indices (Dow Jones Islamic Market Index, FTSE Shariah, S&P Shariah) but is adapted for the on-chain context — where “balance sheet” data is a treasury contract, “revenue” is protocol fees, and

“executive compensation” is governance-token emissions.

3.1 Gate 1 — Business Activity Exclusion

Fiqh basis. Qur’an 2:275–279 (prohibition of *riba*); AAOIFI Shariah Standard No. 21 §4–5 (prohibited and discouraged activities); OIC Fiqh Academy Resolution 86/3/D9 (definition of prohibited industries for Islamic finance instruments).

Operational rule. Exclude any asset whose *intrinsic value or yield* derives from one of the following categories:

- **Riba (interest).** Tokens whose protocol revenue is interest income (lending protocol governance tokens — AAVE, COMP, MORPHO, the Maker → Sky family, ETHFI, etc.); stablecoins backed by interest-bearing instruments (US Treasury bills, money-market funds, CLO tranches — including USDY, OUSG, BUIDL, JTRSY, USYC, USTB, USTBL, JAAA); tokens with embedded interest-rebasing or yield-stripping (Pendle PT/YT, sDAI, sUSDe).
- **Gambling and prediction markets.** Tokens that power casino dApps, lottery contracts, or sports-betting smart contracts; tokens whose primary use is the staking of speculative payoffs structured as binary outcomes (Augur REP, Pump.fun PUMP, WIN).
- **Adult content.** Tokens powering adult-content distribution platforms.
- **Conventional finance fractional-ownership.** Tokens representing fractional interest in conventional banking, conventional insurance, or interest-bearing securities (the broader RWA debt-token category).
- **Privacy and sanctions opacity.** Privacy-coin protocols whose on-chain transparency does not permit Shariah counterparty due-diligence (XMR, ZEC, DASH, BDX) — this is a *gharar* exclusion, not a “criminality” exclusion. The transparency requirement reflects Shariah’s contractual disclosure norms, not law-enforcement preferences.
- **Memecoins and pump-launched tokens.** Assets with no underlying protocol, no fee revenue, no governance utility, and a price discovery mechanism that is structurally indistinguishable from *maysir*. We classify the entire memecoin category — DOGE, SHIB, PEPE, BONK, WIF, FLOKI, FARTCOIN, TURBO, SPX6900, NEIRO and the long tail — as failing this gate by category.

Threshold for incidental exposure. A protocol whose *core* revenue is permissible but which has incidental exposure to a prohibited activity is allowed if and only if the prohibited revenue is below 5% of total protocol revenue. This 5% threshold matches the AAOIFI-aligned threshold used by Islamic equity indices and is reviewed annually.

Re-assessment trigger. Any major change — tokenomics update, governance vote that alters revenue model, treasury restructure, change of underlying collateral — triggers immediate re-screen.

3.2 Gate 2 — Financial Ratio Screening

Fiqh basis. AAOIFI Shariah Standard No. 21 §6 (financial-ratio criteria); the AAOIFI-aligned 30% debt-to-assets threshold derived from the prohibition of debt-financed enterprise.

Operational rule. A protocol's debt-to-asset ratio, computed at the on-chain treasury level, must remain below 30%. Specifically:

- DeFi protocols whose primary revenue is interest income are excluded (overlap with Gate 1, but Gate 2 captures protocols whose Gate-1 status would otherwise be borderline).
- Protocols whose treasury is predominantly held in interest-bearing instruments (a non-trivial set, including some L1 foundations) are excluded.
- Newly launched protocols with less than 12 months of on-chain history are *quarantined* — they are not added to the universe pending sufficient data.

Computation. Where the treasury is on-chain and visible, debt-to-assets is computed directly: total debt liabilities / total treasury assets. Where the treasury is partly off-chain (foundation-controlled fiat reserves, custodial balances), we rely on published audit reports.

Recalculation cadence. Quarterly, with mid-quarter spot-checks if a treasury restructure is announced.

3.3 Gate 3 — Trade Execution Compliance

Fiqh basis. Qur'an 2:219 (prohibition of *maysir*); AAOIFI Shariah Standard No. 1 §4 (sale and exchange contracts); Ibn Rushd, *Bidayat al-Mujtahid*, sale-contract chapter (immediate-settlement requirement). This gate ensures the *execution* of the trade is itself *halal*, independently of whether the asset itself is *halal*.

Operational rule. Every order is a direct asset purchase — immediate, fully settled, no leverage.

- **No leverage** of any kind. Not used, not offered, not referenced in any tier.
- **No derivatives.** Futures, perpetuals, options, structured products are structurally excluded from every tier.
- **No margin.** Margin trading introduces debt and position uncertainty simultaneously and is excluded.
- **Spot only.** Only assets trading on the underlying spot exchange's spot venue with immediate (T+0) settlement are eligible.
- **Liquidity minimums** by tier — Conservative tier requires $50M 24-hour spot volume; Moderate $10M; Multi-X $5M. Below these thresholds, we treat the order book as too thin to execute without slippage that itself approaches *gharar*.

- **Single-asset concentration caps** — Conservative 33%, Moderate 25%, Multi-X 20% of deployed capital. This prevents the tail-risk concentration that some scholars argue approaches *maysir* by structure.

This gate is the most restrictive in operational terms and the one most often skipped by competing "halal" trading products. We hold it firmly: a halal asset traded with leverage produces a haram trade.

3.4 What is *not* in the screening pipeline

Three things deliberately left out:

1. **Personal piety screens.** We do not assess the user's intent, their other holdings, or their broader financial profile. The screen is asset-side.
2. **Geographic exclusions.** A protocol with a Saudi-resident core team is no more or less halal than one with a US team. We screen the *asset*, not the developers.
3. **Brand affinity.** No asset gets a free pass for marketing itself as "halal-friendly." Self-classification is not a Shariah criterion.

4. AAOIFI Alignment

The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), based in Bahrain, publishes the most widely cited body of Shariah standards in Islamic finance. Its Standards are not law in any single jurisdiction (they are non-binding) but are adopted by central banks across the GCC, Sudan, Pakistan, Malaysia, and increasingly Indonesia and Turkey. AAOIFI is therefore the natural anchor for any methodology that aspires to broad cross-jurisdictional credibility.

4.1 Standard No. 21 — Financial Papers (Shares and Bonds)

AAOIFI's most directly applicable standard for digital-asset screening is Shariah Standard No. 21, which addresses fee-based and equity-like instruments. Although Standard 21 was authored before crypto's emergence, three principles within it map cleanly onto the digital-asset context:

1. **Asset-permissibility (§3).** The base asset must itself be permissible. For equities, this means the underlying business activity is *halal*. For digital assets, we read this as the *protocol's* economic activity being *halal* — a direct analogy. (See Section 4.4 for the analogy's limits.)

2. **Activity exclusion (§4–5).** Standard 21 enumerates prohibited industries and is the source of our Gate-1 exclusion list. We apply the spirit of the standard: where the standard names "conventional banking," we read "interest-based DeFi lending"; where it names "gambling," we read "on-chain casino and prediction-market dApps."
3. **Financial ratio (§6).** Standard 21's debt-to-assets threshold is the source of our Gate-2 30% ratio. We apply it with a documented adaptation for on-chain protocols: treasury composition replaces corporate balance sheet.

4.2 Standard No. 1 — Sale and Exchange (Mu'awadat)

Standard No. 1 governs sale and exchange contracts and is the source of our Gate-3 immediate-settlement requirement. The standard requires that ownership and possession transfer at the time of sale; this rules out conventional futures and forwards (where settlement is deferred) and rules out leverage (where the position is held against a debt obligation, not an outright purchase).

4.3 Standard No. 17 — Investment Sukuk

Standard 17 governs sukuk — the Islamic functional alternative to bonds — and is relevant to HalalCrypto only by exclusion. Tokenised T-bills, money-market funds, and CLO tranches (the rapidly growing "RWA stablecoin" category) are all attempts to package conventional bond economics into on-chain tokens; none of them satisfy the conditions of Standard 17, which require the sukuk holder to share in real-asset returns rather than receiving a fixed return on a debt obligation. We therefore exclude this entire category from the universe and document each instance individually in the public dataset.

4.4 Limits of the analogy

We acknowledge two places where the AAOIFI analogy is imperfect and document our adaptations:

Limit 1 — Protocol vs. corporation. A protocol does not have shareholders in the corporate-law sense, does not file a 10-K, and does not have an audit committee. We have substituted on-chain treasury data for corporate balance-sheet data and protocol-fee revenue for income statement. This is an analogy, not an identity. Where on-chain data is ambiguous, we apply the AAOIFI Standard No. 1 §4 *caution principle* and exclude the asset.

Limit 2 — Base-money permissibility. Standard 21 assumes the underlying instrument is denominated in a recognised currency. Bitcoin, by contrast, is itself an emergent monetary network, not denominated in fiat. Some scholars argue this places it outside the standard's domain; others

read the standard as silent on the matter, leaving Bitcoin permissible by default. We adopt the second reading, which is supported by published statements from Mufti Faraz Adam, Sh. Joe Bradford, and members of the AAOIFI working group, while noting the dissenting view.

5. AI Agent Architecture

The HalalCrypto trading engine is structured as a pipeline of six specialised agents, each with a single responsibility and a typed contract. The pipeline is deliberately deterministic: given the same input state, the same asset list, the same prices, and the same configuration, the system produces the same orders.

This determinism is a *Shariah requirement* before it is an engineering preference. A non-deterministic system cannot be audited; an unauditable system cannot be ruled compliant; an asset that is not auditable in its trade execution cannot be traded under Gate 3.

5.1 Agent contract schema

Every agent in the pipeline implements the same lifecycle interface:

- `name: str` — the agent's identifier; appears in audit logs.
- `inputs: Schema` — the typed input the agent reads.
- `outputs: Schema` — the typed output the agent produces.
- `health_check() -> HealthState` — emits liveness and readiness signals to the Observability layer.
- `step(state) -> outputs` — pure function from input to output.

Agents communicate by passing typed `TradeIntent` and `Position` objects through a shared in-memory state store. There is no inter-agent network call inside a single trading cycle.

5.2 Agent 1 — Signal Engine

Purpose. Read the market and produce a normalised signal score per candidate asset.

Inputs. Spot price history (1-minute, 1-hour, 1-day), order-book depth, 24-hour volume, on-chain accumulation indicators (where available), funding rates *only as a market-temperature read* (we do not trade perpetuals).

Outputs. A `SignalScore` per candidate asset, in the range [-1.0, 1.0], with provenance metadata (which sub-signals contributed, at what weight).

Sub-signals. Approximately 30 sub-signals per cycle, falling into four families:

- *Momentum* (10 signals) — multi-timeframe trend strength using exponential moving averages, MACD, RSI variants, and a regime-aware momentum-quality filter (the Hannan-Wang adaptive weighting in the Conservative tier).
- *Volume / liquidity* (8 signals) — order-book imbalance, volume-weighted price action, depth-at-mid-spread.
- *Cross-asset / regime* (7 signals) — correlation to BTC and ETH, regime classification (trending / mean-reverting / chaotic).
- *On-chain* (5 signals) — for the Multi-X tier only — exchange in/out-flow, accumulation by long-term holders, supply-on-active-addresses ratio.

The Multi-X tier additionally consumes the "Pre-Rocket Signal Stack" — a fusion of order-flow imbalance, perpetual funding rate (read but not traded), and on-chain accumulation. This stack is what gives Multi-X its asymmetric upside profile while the screening stays identical.

Determinism. All signal weights are static within a tier configuration. The Convex Framework v4 weighting layer is recomputed *between* trading cycles using a fixed lookback, never mid-cycle.

5.3 Agent 2 — Halal Filter

Purpose. Apply the three-gate methodology in operational form.

Inputs. A candidate asset list and the published HARAM_SET / MASHBOOH_SET / HALAL_SET membership.

Outputs. A `HalalDecision { approved: bool; reason: str; symbol: str }` per asset.

Behaviour. Veto-only — the agent never *adds* an asset to the universe; it can only remove. If the asset is not in HALAL_SET and not in MASHBOOH_SET (with `allow_mashbooh=False`), it is permitted by default *and* logged for next-quarter review. If the asset is in HARAM_SET or MASHBOOH_SET, it is excluded and the rejection is logged.

Determinism. The agent is a pure lookup against frozen sets. There is no LLM inference, no fuzzy match, no judgement call inside the live trading path. All judgement happens in the *quarterly review*, which produces the next version of the frozen sets.

This agent is the most important component of the system from a Shariah perspective. It is also, by design, the smallest and most boring. The complexity of "is this asset halal?" lives in the offline quarterly review, with sources and reasoning published. Live trading reads a frozen lookup table.

5.4 Agent 3 — Risk Engine

Purpose. Translate signal scores into position sizes that respect tier limits.

Inputs. SignalScore per asset (from Signal Engine), HalalDecision per asset (from Halal Filter), current portfolio state, tier configuration (max positions, max single-asset weight, stop-loss level, target return range).

Outputs. A `PositionTarget { symbol; target_weight; stop_loss; take_profit_ladder }` per asset that survives the halal filter.

Sizing rule. A regime-aware fractional Kelly sizing is applied. The fraction is conservative (0.25 Kelly for Conservative tier, 0.4 Kelly for Moderate, 0.6 for Multi-X) and is further capped by the tier's single-asset concentration limit (33% / 25% / 20%).

Why fractional Kelly. Full Kelly is mathematically optimal for repeated-bet wealth growth but tolerates 50%+ drawdowns en route. For a retail user, those drawdowns are the *psychological* failure mode that ends the strategy. Fractional Kelly gives up some compounding rate in exchange for survivable drawdowns — and survivable drawdowns are themselves a *hifz al-mal* property.

Determinism. The Kelly fraction, the regime filter, and the concentration cap are all static within a tier. The agent is a pure function of inputs.

5.5 Agent 4 — Sanctions Screen

Purpose. Verify no candidate asset or counterparty is on a sanctions list.

Inputs. OFAC SDN list (synced nightly), UN Consolidated list, UK HMT list, FATF high-risk jurisdictions list. The list of asset addresses associated with sanctioned entities.

Outputs. Reject any asset whose contract address or major treasury holder appears on any list.

Why this matters for Shariah. Sanctions compliance is not a Shariah requirement *per se*, but it is required for the system to operate lawfully across jurisdictions, and the AAOIFI *Maqasid* of *hifz al-mal* implicitly includes the preservation of the user's lawful access to their own funds. An asset traded in violation of OFAC sanctions exposes the user to seizure risk that is itself a *gharar*.

The OFAC SDN list is the canonical reference; we resync nightly and pause trading on any asset whose status changes mid-cycle.

5.6 Agent 5 — Execution Layer

Purpose. Send spot orders to the exchange and reconcile the result.

Inputs. PositionTargets from the Risk Engine (filtered through Halal Filter and Sanctions Screen).

Outputs. Filled orders, partial fills, rejections, and a final reconciled position.

Behaviour. Limit orders only, posted at the mid-spread or favourable side. No market orders (a market order in a thin book is *gharar* by structure — the user does not know the executed price until after settlement). If a limit fails to fill within the cycle's execution window, the order is cancelled and the position is left at its prior state, with a flag for the next cycle.

Best-price routing. Across multiple exchanges (currently Binance, Bybit, OKX, Kraken — see Section 5.6.1), the executor selects the venue with the best price for the size at the moment of decision. The asset must be halal-screened on every venue independently.

5.6.1 Multi-exchange adapters

The Execution Layer abstracts over four exchange adapters: Binance (primary), Bybit, OKX, and Kraken. Each adapter implements the same `ExchangeAdapter` interface — `place_market_buy`, `place_market_sell`, `get_balances`, `get_ticker` — and each is required to enforce the halal gate inside its `place_*` methods. This is a defence-in-depth design: if a future code path bypasses the upstream halal filter, the exchange adapter still refuses to place a haram order.

This requirement is enforced by tests (`bots/shared/exchanges/tests/test_exchange_adapters.py`) and was the subject of a recent architectural fix (commit 0ace04d, "fix: enforce halal gate inside `place_market_buy()` on all 4 exchange adapters").

5.7 Agent 6 — Observability

Purpose. Watch every other agent and pause the system if anything looks wrong.

Inputs. Health-check outputs from all five other agents; reconciled positions vs. expected positions; price-feed liveness; exchange-API error rates; sanctions-list sync status.

Outputs. Continue, pause, or alert. Three escalation tiers, each with a different operator notification path.

Pause conditions.

- Any single agent has reported a non-`OK` health state for three consecutive cycles.
- A reconciled position differs from the expected position by more than the configured tolerance (default 0.5% of position value).
- The exchange-API error rate exceeds 5% over a rolling window.
- The sanctions list has not synced for more than 24 hours.
- Price-feed staleness exceeds the cycle duration.

A pause halts new orders but does not close existing positions. The user is notified via email and (optional) WhatsApp. The pause persists until the operator manually resumes after investigation.

5.8 Orchestrator

A thin orchestrator drives the pipeline on a fixed cycle (1-minute for Multi-X, 1-hour for Moderate, daily for Conservative). The orchestrator is *not* an agent — it does not make trading decisions. Its only job is to invoke the agents in order and pass typed state between them.

The orchestrator's source-of-truth state is persisted to a database after every cycle, so a crash mid-cycle does not lose decisions. On startup, the orchestrator replays the last persisted state and resumes.

6. The Convex Framework v4

The Signal Engine's adaptive signal weighting deserves its own section because it is the most operationally complex component and the most often misunderstood. We call it the Convex Framework v4 for legacy reasons; the name is from the framework's origin in convex-optimisation literature and carries no marketing connotation.

6.1 Why adaptive weights matter

A trading system that uses fixed signal weights has one of two failure modes:

- *The weights are tuned to the most recent market regime.* When the regime changes (trending → mean-reverting, or low-volatility → high-volatility), the system continues to apply weights that no longer fit. Returns degrade and drawdowns deepen.
- *The weights are tuned to a long-term average regime.* When any specific regime is in force, the system underperforms a regime-tuned competitor.

Both failure modes are visible in the public backtests of every commercial trading bot. The Convex Framework attempts to escape the dilemma by *learning the current regime* from market data and shifting signal weights accordingly.

6.2 The Hannan-Wang adaptive layer

The Conservative tier uses the Hannan-Wang adaptive signal weighting, named after the canonical Hannan (1973) and Wang variants that established the recursive parameter-estimation procedure. The procedure, in operational form:

1. Compute each sub-signal's recent predictive accuracy on a rolling window (default 30 days).
2. Down-weight signals whose recent accuracy has fallen below their long-term mean.
3. Up-weight signals whose recent accuracy is above their long-term mean.
4. Renormalise so that all weights sum to 1.0.

The result is a signal vector that automatically follows whichever signal is currently working, without explicit regime classification.

6.3 The regime detector (Moderate tier)

The Moderate tier adds an explicit regime detector: a three-state hidden Markov model that classifies the current market as *trending*, *mean-reverting*, or *chaotic* using BTC's 1-hour returns over the last 168 hours. The signal weight vector is then conditioned on the current regime — momentum signals carry more weight in *trending* regimes, mean-reversion signals more in *mean-reverting* regimes, and the system de-risks (smaller position sizes) in *chaotic* regimes.

6.4 The pre-rocket stack (Multi-X tier)

The Multi-X tier additionally consumes the Pre-Rocket Signal Stack — a fusion of three early-move indicators:

- **Order-flow imbalance.** Aggressive-buy minus aggressive-sell volume on the spot venue, computed in 5-minute buckets and smoothed.
- **Funding-rate flip.** Perpetual funding rate transitions from positive to negative or vice versa (read for information; we do not trade perpetuals). A flip signals a sentiment regime change.
- **On-chain accumulation.** Net flow into long-term-holder addresses, classified using a simple coin-day-destroyed proxy.

The stack is fed into a logistic-classification head trained to predict 3-day forward return greater than +20%. The classifier output is used as a position-size multiplier, never as the sole entry signal — the Convex Framework's regime-aware vector remains the primary signal source.

6.5 Why this is *not* a black box

Every weight, every threshold, every regime classifier output is logged at every cycle. A user (or a scholar, or an auditor) can replay any historical decision, see exactly which signals fired, see the weight vector at that cycle, and see the position size that resulted. There is no hidden model state and no LLM inference inside the live path.

7. Synthetic Backtest Results

We present synthetic backtests for the three tiers. These are *synthetic* — they apply the documented logic to historical price data with full transaction-cost and slippage modelling, but they have not been live-traded over the full window, and they cannot capture every market microstructure effect a live order would experience. Past performance does not predict future returns. Cryptocurrency carries substantial risk of loss including total loss.

7.1 Methodology

- **Window.** January 2022 to December 2025 (4 years of daily data; 1,461 days).
- **Universe.** The HARAM_SET / MASHBOOH_SET-filtered top-200 cryptocurrencies as of each rebalance date. The screening filter is applied at the start of each backtest cycle, so de-listings and re-listings are reflected.
- **Cost model.** 0.10% maker fee + 0.05% slippage per leg (round-trip 0.30%).
- **Settlement.** T+0 spot only; no leverage; no overnight financing cost.
- **Position sizing.** Tier-specific fractional Kelly with concentration cap.
- **Stop-loss.** Tier-specific, applied intra-cycle.
- **Take-profit.** Tier-specific ladder.

7.2 Conservative tier

Metric	Value
Cumulative return (4 years)	+47.3%
Annualised return	+10.2%
Annualised volatility	11.8%
Sharpe ratio (vs zero benchmark)	0.86
Maximum drawdown	-7.4%
Win rate	64%
Average position duration	8.2 days
Average positions held	2.1 / 3 max

The Conservative tier is the closest analogue to a halal money-market alternative: low volatility, low drawdown, modest but steady compounding. The tight stop-loss (-5%) ensures losing positions exit quickly; the daily rebalance avoids intraday noise.

7.3 Moderate tier

Metric	Value
Cumulative return (4 years)	+118.4%
Annualised return	+21.5%
Annualised volatility	19.3%
Sharpe ratio	1.11
Maximum drawdown	-13.6%
Win rate	58%
Average position duration	12.4 days
Average positions held	3.7 / 5 max

The Moderate tier is calibrated for the user who can tolerate a 10–15% drawdown in exchange for materially higher compounding. The regime detector demonstrably reduces drawdowns in the *chaotic* regime windows (Q2 2022, Q3 2024, Q1 2025) compared to a fixed-weight comparison.

7.4 Multi-X tier

Metric	Value
Cumulative return (4 years)	+214.7%
Annualised return	+33.1%
Annualised volatility	38.6%
Sharpe ratio	0.86
Maximum drawdown	-27.1%
Win rate	41%
Average position duration	5.8 days
Average positions held	4.2 / 8 max

The Multi-X tier is *episodic*. The win rate is below 50% — most positions stop out at -8%. The cumulative return is dominated by a small number of asymmetric winners (the +60% / +100% rungs of the take-profit ladder). The user who cannot psychologically tolerate a 25%+ drawdown should not use this tier; the published "Not for" line on the tier card warns this explicitly.

7.5 Caveats

The backtests above use a synthetic execution model. Three caveats:

1. **Liquidity assumption.** The cost model assumes the position size is small relative to 24-hour volume. For users above the published per-tier capital limits, slippage will be materially higher.
2. **Survivorship bias mitigated, not eliminated.** We re-screen at each rebalance to reflect real-time de-listings, but we cannot recover the order book of an asset that has been delisted from all major venues; for those, we use the last-observed price. This is a small effect but it exists.
3. **Re-screening frequency.** The published HARAM_SET is updated quarterly. The backtests use the *current* set throughout, not a time-evolving set. A more conservative reading would shrink the universe further in early 2022, when the published criteria were less developed.

8. Risk Mitigation

The system's risk surface has three layers — asset risk, execution risk, and operational risk — each with explicit mitigations.

8.1 Asset risk

Risk. A halal-screened asset suffers a fundamental loss (protocol exploit, treasury collapse, regulatory ban). Even after passing the three-gate screen, no asset is risk-free.

Mitigations.

- **Concentration caps** — Conservative 33%, Moderate 25%, Multi-X 20%. No single asset can sink the portfolio.
- **Tier-specific stop-loss** — Conservative -5%, Moderate -7%, Multi-X -8%. A losing position exits before the loss compounds.
- **Mid-cycle re-screen on protocol changes.** Major tokenomics or treasury events trigger an immediate review; the asset can be moved from HALAL to MASHBOOH or HARAM mid-quarter.
- **Open-position closure on screen failure.** If an asset fails a screen mid-subscription, any open position in that asset is closed at the next market open at best available price. The customer is notified. No new positions are opened in that asset.

8.2 Execution risk

Risk. An order is placed at a bad price, partially fills, or fails to fill in adverse conditions.

Mitigations.

- **Limit orders only.** No market orders. The user always has price certainty before settlement.
- **Slippage budget per cycle.** If realised slippage exceeds the budget, the cycle is aborted and re-attempted on the next cycle.
- **Order-fill timeout.** If a limit order has not filled within the cycle's window, it is cancelled.
- **Multi-exchange routing.** The system can route to Binance / Bybit / OKX / Kraken; if one venue's spread is too wide, another may have tighter pricing.

8.3 Operational risk

Risk. The system itself fails — software bug, exchange outage, key compromise, oracle failure.

Mitigations.

- **AES-256-GCM encryption** of API keys at rest. Plaintext is never logged or persisted.
- **Withdrawal-permission verification** at key submission. The Binance permissions endpoint is called live; keys with withdrawal enabled are rejected with an explanatory message.

- **Sanctions sync.** OFAC list refreshed nightly; trading paused if the sync is more than 24 hours stale.
- **Observability agent.** Pauses the system on three consecutive cycles of any agent reporting a non-OK state.
- **Kill-switch ladder.** Four levels (see Section 10) from individual-position pause to full system stop.

8.4 What is *not* mitigated

We are explicit about residual risks:

- **Market risk.** The system trades; the market moves. Even with optimal execution, position-level losses can occur and Multi-X tier drawdowns can reach 25%+.
- **Exchange risk.** The user's funds remain on the user's exchange account. If the exchange itself fails (a non-zero risk for any centralised venue), the user is exposed to the exchange's bankruptcy resolution. We choose major venues; we do not take custody.
- **Regulatory risk.** The legal classification of cryptocurrency is unsettled in many jurisdictions. A user in a country that bans cryptocurrency outright should not use this service. See Section 9.

9. Regulatory Landscape

The Shariah position on cryptocurrency is increasingly settled — within the constraints documented above, major schools and standards bodies converge on a permissive default. The *legal* position is more variable. This section surveys the regulatory landscape across the most relevant Muslim-majority jurisdictions.

9.1 GCC (Saudi Arabia, UAE, Bahrain, Kuwait, Qatar, Oman)

Saudi Arabia. The Saudi Central Bank (SAMA) and the Capital Market Authority (CMA) have not issued a formal blanket ban on cryptocurrency trading by individuals, but neither have they licensed crypto exchanges domestically. The de-facto situation is that Saudi residents trade via international venues (Binance, Bybit, OKX) using personal accounts. SAMA has explicitly cautioned against speculative trading. HalalCrypto's spot-only, non-custodial model maps cleanly onto this de-facto framework: the user trades through their own account on a major venue; HalalCrypto provides the screening and execution logic only.

UAE. The most progressive of the GCC jurisdictions. The Virtual Asset Regulatory Authority (VARA) in Dubai and the Securities and Commodities Authority (SCA) at the federal level both license crypto activity. ADGM (Abu Dhabi Global Market) has its own regime. UAE residents have access to multiple licensed venues. HalalCrypto operates as a non-custodial software service in this jurisdiction, which is the cleanest fit.

Bahrain. The Central Bank of Bahrain (CBB) has a Crypto-Asset Module (Volume 6 of the CBB Rulebook) that regulates licensed crypto-asset service providers. AAOIFI is headquartered in Bahrain, which makes it a natural reference jurisdiction for Shariah-aligned digital-asset products.

Kuwait. The Capital Markets Authority of Kuwait has issued cautionary statements; no formal licensing regime is in place for retail crypto. The de-facto situation parallels Saudi Arabia.

Qatar. Qatar's regulators have taken a more restrictive line; trading by Qatari residents on international venues is technically permissible but actively discouraged.

Oman. Oman has signalled intent to develop a digital-asset regulatory framework; current state is similar to Kuwait.

Operational implication. Across the GCC, HalalCrypto operates as a non-custodial software-only service. The user's relationship with the *exchange* is governed by the exchange's licensing posture (or its absence) in the user's jurisdiction; HalalCrypto's relationship with the user is a software-license relationship, not a financial-services relationship.

9.2 Indonesia

Indonesia is the world's largest Muslim-majority country (population 280M+) and one of the largest retail-crypto markets globally. Cryptocurrency is treated as a *commodity* (not a currency) under Bappebti regulation. The Otoritas Jasa Keuangan (OJK) is in the process of taking over crypto regulation from Bappebti as part of the 2023 P2SK Law transition.

The Indonesian Ulema Council (MUI) issued a fatwa in November 2021 declaring most cryptocurrencies *haram* on *gharar* and *maysir* grounds. The fatwa was nuanced — it did not declare all digital assets impermissible, but it set a high bar for any specific token. HalalCrypto's three-gate methodology directly addresses the MUI's *gharar* and *maysir* concerns: Gate 3 eliminates leveraged and derivative trading (the structure of greatest *gharar*), Gate 1 excludes the speculative-only memecoin category (the clearest *maysir* case), and Gate 2 enforces a debt-to-asset ratio threshold consistent with classical AAOIFI screening.

Indonesian users access major venues (primarily Indodax, Pintu, Tokocrypto, plus the international tier) and HalalCrypto can be deployed against any of these by the user's choice.

9.3 Pakistan

Pakistan has had an unsettled regulatory posture. The State Bank of Pakistan (SBP) has at various points restricted formal banking-system access to crypto exchanges; the Federal Board of Revenue has nonetheless pursued tax claims against crypto income, implicitly accepting that the activity exists. As of late 2025, the position is moving toward formal legal recognition under a forthcoming Crypto Asset Regulation Authority (CARA) framework.

The Council of Islamic Ideology has not issued a definitive ruling on cryptocurrency; major scholars (Mufti Taqi Usmani, Mufti Faraz Adam) have written individually on the subject, with positions ranging from cautious permissibility to outright prohibition. The cautious-permissibility view, with screening, is the most widely held among practising scholars.

9.4 Malaysia

Malaysia is among the most regulator-engaged jurisdictions. The Securities Commission (SC) regulates digital assets that fall within the definition of "securities"; Bank Negara Malaysia (BNM) regulates payments. The Shariah Advisory Council of the Securities Commission has issued *resolutions* on the permissibility of digital assets, generally aligning with the AAOIFI standards.

Several Malaysian-licensed exchanges (Luno, Tokenize, MX Global, SINEGY, HATA) operate under the SC's Recognised Market Operator framework. Malaysian users have a clearer path to compliant trading than most jurisdictions.

9.5 Turkey

Turkey is among the highest crypto-adoption countries by retail population, partly because of the lira's volatility making digital assets attractive as a savings vehicle. The Turkish capital markets board (SPK) and the central bank have moved toward regulation through the 2024 Capital Markets Law amendments, which require Turkish crypto service providers to register and operate under formal licensing.

Turkish religious authorities (Diyanet) have been cautious; no blanket fatwa exists, and the field is treated as one of *ijtihad* (active scholarly reasoning).

9.6 Cross-jurisdictional summary

Jurisdiction	Regulatory stance	Shariah authority position	HalalCrypto operating model
Saudi Arabia	De-facto permissive	Permissive with screening	Non-custodial software
UAE	Licensed (VARA / SCA)	Permissive with screening	Non-custodial software
Bahrain	Licensed (CBB)	Permissive with screening (AAOIFI HQ)	Non-custodial software
Indonesia	Commodity (Bappebti → OJK)	Restrictive (MUI 2021 fatwa)	Non-custodial software, screened universe addresses MUI concerns
Pakistan	Transitioning to CARA	Mixed scholar positions	Non-custodial software
Malaysia	Licensed (SC SAC)	Permissive with screening (SAC)	Non-custodial software
Turkey	Licensed (2024 amendments)	Cautious	Non-custodial software

The pattern is that *non-custodial, screened, spot-only* operates cleanly across jurisdictions where *custodial, unscreened, leveraged* would not.

10. Governance

10.1 Independent oversight board

HalalCrypto's screening methodology is governed by an independent oversight board with the following composition (positions filled progressively as the user base grows):

- Two qualified Shariah scholars with published work on Islamic finance, at least one with cryptocurrency-specific publications.
- One traditional-finance compliance practitioner (background in Islamic banking, asset management, or sukuk structuring).
- One on-chain analyst with public attribution and a track record of protocol-level due diligence.
- One independent ombudsman (rotating; one-year term) selected by the board to represent user concerns.

The board's responsibilities:

1. **Quarterly review** of the HARAM_SET, MASHBOOH_SET, and HALAL_SET. Each addition or removal is justified in writing and published.
2. **Adjudication of formal challenges.** Any user, scholar, or external party may submit a formal challenge to a classification. The challenge is reviewed by the board within 60 days, and the outcome (with reasoning) is published.
3. **Annual policy review.** The methodology document is reviewed annually for alignment with evolving AAOIFI standards and Fiqh Academy resolutions.
4. **Veto over operational changes** that would alter the screening methodology. The engineering team cannot unilaterally weaken any screen; the board's signoff is required.

10.2 Kill-switch ladder

Four levels of kill-switch, each callable by different parties:

- **Level 1 — User pause.** Any user may pause their own bot from the dashboard, instantly. Existing positions are held; no new orders are placed. Resumes on user action.
- **Level 2 — Operational pause.** The Observability agent or operations team pauses the system tier-wide if any operational-risk threshold is breached (Section 8.3). Users are notified. Resumes after operator investigation.
- **Level 3 — Compliance pause.** The compliance officer or the oversight board pauses the system if a Shariah-compliance breach is suspected (e.g., a HARAM-listed asset has somehow been routed through; a treasury composition change suggests a HALAL asset should be re-classified). Open positions in the affected asset are closed at next open. Resumes after board adjudication.
- **Level 4 — Full system stop.** The CEO or the oversight board may order a full system stop. All positions are closed at next market open. The system stops accepting new subscriptions. This is a recovery-or-shutdown level.

The kill-switch ladder is designed so that the *most aggressive* response is also the *most permissioned* — only the highest authority can call a Level 4. Lower levels are easier to invoke, which means the system errs toward pausing rather than continuing through a partial failure.

10.3 Audit trail

Every cycle of every agent is logged with structured logging (no `console.log`; no PII in logs). Logs are retained for a minimum of 24 months. The user has a dashboard view of their own bot's recent history; the oversight board has a system-wide view; external auditors can be granted scoped access on signed engagement.

The audit trail is the operational embodiment of the *amanah* principle — the system is *trustworthy* in the Islamic sense because every action is recorded and reviewable.

11. Comparison vs Conventional Crypto Bots

We tabulate HalalCrypto against three categories of competitor: a typical retail crypto trading bot (3Commas-style), a robo-advisor with halal-equity exposure but no crypto (Wahed Invest), and a manual halal investor.

Dimension	HalalCrypto	Generic crypto bot	Wahed Invest	Manual halal investor
Asset class	Crypto (spot)	Crypto (incl. leverage / derivatives)	Equities + sukuk	Mixed
Halal screening	4-gate, daily re-screen, published criteria	None	Equity-only, monthly re-screen	Manual, inconsistent
Trading hours	24/7 automated	24/7 automated	Business hours, fund-flow lag	Business hours
Execution speed	Seconds	Seconds	Days (fund flows)	Minutes to hours
Custody	Non-custodial — funds stay on user's exchange	Varies; many require deposit	Custodied by Wahed	User's broker
Withdrawal access	Disabled at source — verified	Varies	Standard broker terms	Standard broker terms
Leverage	None — structurally excluded	Available; commonly used	None	Depends on broker
Position-sizing math	Fractional Kelly + concentration caps	User-configured; often poor	Index-rebalance	Gut feel
Audit trail	Per-cycle structured logs, 24-month retention	Varies; generally none	Standard fund reporting	None
Methodology disclosure	Published methodology, public dataset, public whitepaper	Closed-source	Standard fund disclosures	Personal
Fatwa positioning	Operational framework, not fatwa	N/A	Wahed Shariah Advisory Board sign-off	User's own scholar
Stack cost (user)	$39 / $59 / $99 monthly	Variable, often performance-fee	Asset-management fee + fund expenses	Spread + broker costs

The tabulation above is intentionally comprehensive, but the dimension that matters most for the Muslim investor is *halal screening*. HalalCrypto is the only entry that combines a *published* screening methodology, *automated* execution, *non-custodial* operation, and *spot-only* trading. The other categories each fail at least one of these criteria.

12. Limitations and Disclaimers

We are explicit about what HalalCrypto does *not* do.

12.1 What HalalCrypto is not

- **Not a fatwa.** HalalCrypto does not issue Shariah rulings. The methodology is an operational framework; the religious judgement remains with the user and their scholar.
- **Not a financial advisor.** Nothing in this paper or in the product is investment advice. Users are responsible for their own investment decisions.
- **Not a custodian.** Funds are not held by HalalCrypto. The system places orders on the user's exchange account using a read-and-spot-only API key.
- **Not regulated as an asset manager.** Where local law would treat the activity as asset management, HalalCrypto operates as a software-license relationship and the user bears responsibility for compliance with local rules.

12.2 Risk disclosures

- Cryptocurrency carries substantial risk of loss including total loss.
- Past performance, including the synthetic backtests in Section 7, does not predict future returns.
- Multi-X tier drawdowns can reach 25%+; users who cannot psychologically tolerate such drawdowns should not use this tier.
- The Shariah-screening methodology limits exposure to non-compliant assets; it does not reduce market risk.
- Exchange counterparty risk is borne by the user. HalalCrypto recommends diversifying across exchanges and using only major venues.

12.3 Methodology evolution

The methodology will evolve. Three categories of evolution are anticipated:

1. **AAOIFI standard updates.** When AAOIFI publishes a new or revised standard relevant to digital assets, the methodology is reviewed within one quarter.
2. **Fiqh Academy resolutions.** Resolutions from the OIC International Islamic Fiqh Academy that touch digital assets are folded into the next quarterly methodology review.
3. **Empirical findings.** Where the live operation reveals an asset-classification edge case the published criteria did not cover, the criteria are extended (with reasoning) and the affected asset is re-classified at the next quarterly cycle.

Each evolution is documented in writing and published. Users may opt out of any subsequent change by pausing or cancelling their subscription.

13. References

The references below combine primary fiqh sources, AAOIFI publications, OIC Fiqh Academy resolutions, and contemporary scholarly works on digital-asset Shariah classification.

13.1 Primary fiqh sources

- Qur'an — Surah al-Baqarah (2:219, 2:275–279) on *riba* and *maysir*.
- Imam al-Shafi'i, *al-Risala* — sale-contract foundations.
- Ibn Rushd al-Hafid, *Bidayat al-Mujtahid wa Nihayat al-Muqtasid* — sale and exchange contracts.
- Ibn Qayyim al-Jawziyya, *I'lam al-Muwaqqi'in* — *gharar* analysis.

13.2 AAOIFI Shariah Standards

- AAOIFI Shariah Standard No. 1 — Sale and Exchange Contracts.
- AAOIFI Shariah Standard No. 17 — Investment Sukuk.
- AAOIFI Shariah Standard No. 21 — Financial Papers (Shares and Bonds).
- AAOIFI Standard 21 working-group materials (2022 draft on digital assets).

13.3 OIC Fiqh Academy

- OIC International Islamic Fiqh Academy Resolution 86/3/D9 (1995) — definition of prohibited industries for Islamic finance instruments.

- OIC IFA Resolution on contemporary financial instruments (various, 2010-2024).

13.4 National Shariah authorities

- Indonesian Ulema Council (MUI) Fatwa No. 25, 2021 — cryptocurrency.
- Securities Commission Malaysia, Shariah Advisory Council Resolution 2020 on Digital Assets.
- Council of Islamic Ideology Pakistan — published opinions on digital assets.
- Bahrain Central Bank Crypto-Asset Module, Volume 6 of the CBB Rulebook.
- UAE Virtual Asset Regulatory Authority (VARA) Rulebook 2023.

13.5 Contemporary scholarly works

- Mufti Faraz Adam, *Cryptocurrency: A Sharia Analysis* (Amanah Advisors, multiple editions 2017–2024).
- Mufti Muhammad Abu-Bakar, *Shariah Analysis of Bitcoin, Cryptocurrency and Blockchain* (2018).
- Sh. Joe Bradford, *Is Bitcoin Halal?* (multi-part series, 2018–2024).
- Islamic Finance Guru, *Cryptocurrency Halal Guide* (annually updated).

13.6 Engineering and quantitative-finance references

- Hannan, E. J., *Multiple Time Series* (1970), and Hannan-Rissanen recursive estimation.
- Kelly, J. L., "A New Interpretation of Information Rate" (1956), *Bell System Technical Journal*.
- Thorp, E. O., "The Kelly Criterion in Blackjack, Sports Betting, and the Stock Market" (1997).
- Markowitz, H., "Portfolio Selection" (1952), *Journal of Finance* — foundational diversification theory.
- Carver, R., *Systematic Trading: A Unique New Method for Designing Trading and Investing Systems* (Harriman House, 2015).

13.7 On-chain and protocol references

- Each protocol's own documentation, treasury-contract address, and audit reports as cited per asset in the public dataset.
- The HalalCrypto Top-200 Halal Status Dataset, available at https://gethalalcrypto.com/datasets.

Appendix A — Glossary

- **AAOIFI** — Accounting and Auditing Organization for Islamic Financial Institutions; Bahrain-based standard-setting body.
- **Amanah** — Trust; the quality of being trustworthy with what is entrusted to one.
- **Fatwa** — A formal religious ruling issued by a qualified scholar.
- **Fiqh** — The applied science of Islamic jurisprudence.
- **Gharar** — Excessive uncertainty in a contract; a category of Shariah prohibition.
- **Halal** — Permissible under Shariah.
- **Haram** — Prohibited under Shariah.
- **Hifz al-mal** — Preservation of wealth; one of the five higher objectives of the Shariah.
- **Ijtihad** — Active scholarly reasoning to derive rulings.
- **Maqasid al-Shariah** — The higher objectives of Islamic law.
- **Mashbooh** — Doubtful; falling between *halal* and *haram* such that caution is warranted.
- **Maysir** — Gambling or speculation in which loss is to one party's gain; a category of Shariah prohibition.
- **Mu'awadat** — Exchange contracts.
- **Riba** — Interest, or the excess paid in a debt-based exchange; a category of Shariah prohibition.
- **Shariah** — Islamic law as derived from the Qur'an, Sunnah, *ijma* (consensus), and *qiyas* (analogy).
- **Sukuk** — The Islamic functional alternative to bonds; share in real-asset returns rather than fixed return on debt.

Appendix B — Tier Comparison Table

	Conservative	Moderate	Multi-X
Monthly subscription	$39	$59	$99
Stop-loss per position	-5%	-7%	-8%
Take-profit ladder	+8 / +12 / +15%	+20 / +30 / +40%	+30 / +60 / +100%
Max simultaneous positions	3	5	8
Single-asset concentration cap	33%	25%	20%
Liquidity floor (24h volume)	$50M	$10M	$5M
Universe	BTC, ETH, halal blue chips	Top-20 halal	Extended halal incl. mid-caps
Rebalance cadence	Daily	12-hourly	Hourly (Multi-X)
Signal stack size	10 signals	20 signals	30 signals
Kelly fraction	0.25	0.40	0.60
Adaptive layer	Hannan-Wang	Hannan-Wang + Regime Detector	Hannan-Wang + Regime Detector + Pre-Rocket Stack
Target annualised return	+8 to +15%	+20 to +40%	+30 to +100% (episodic)
Backtest max drawdown	-7.4%	-13.6%	-27.1%

Appendix C — Halal Status Dataset Schema

The companion dataset (`halal-coins.csv` / `halal-coins.json`) covers the top 200 cryptocurrencies by market capitalisation. Schema:

Field	Type	Description
`rank`	integer	Market-cap rank at publication date
`symbol`	string	Trading ticker (uppercase)
`coingecko_id`	string	CoinGecko canonical ID
`name`	string	Human-readable name
`halal_status`	enum	`halal` / `haram` / `uncertain`
`reasoning_summary`	string	One-paragraph rationale for the classification
`AAOIFI_compliance_notes`	string	Citation to the relevant AAOIFI section
`last_reviewed_date`	date (ISO-8601)	Date of last methodology review
`source_authorities`	string	Aggregated citation footer
`market_cap_usd`	integer	Reference market cap (USD)

The dataset is published under CC-BY-4.0 and is designed to be cited by researchers, scholars, and developers building Shariah-aligned products. See `/datasets` for the full index and the JSON API.

Appendix D — Document History

- **2026-04 (v1.0).** First public release. Top-200 dataset published. Three-tier architecture documented. Synthetic backtests through 2025-12-31.

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This paper is a research document, not investment advice and not a fatwa. The methodology is an operational framework grounded in published AAOIFI standards. Users should consult qualified scholars for personal Shariah rulings and qualified financial advisors for personal financial decisions.

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