VERIDIAN PROTOCOL FZCO

DRHM

Protocol Architecture & Yield Mechanics

A Technical Whitepaper

A regulated, Shariah-compliant, yield-bearing synthetic currency protocol

Delta-neutral reserve · ERC-4626 yield vault · AI-governed treasury

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Abstract

DRHM is a fully reserve-backed synthetic currency protocol that maintains a one-to-one peg to a Gulf reference currency through a delta-neutral, predominantly sovereign reserve, while distributing the carry generated by that reserve to opt-in savers. The system is expressed as four interoperable tokens: a transactional unit (DRHM), a yield-bearing vault share (sDRHM, ERC-4626), a governance token (DGT), and a reserve claim (DRT). This paper specifies the protocol architecture and gives the mathematical foundations of its peg, its reserve and collateralisation invariants, its yield-aggregation and distribution waterfall, the share-accounting of the savings vault, a stochastic model of perpetual-futures funding that underpins the bear-market yield floor, and a solvency-and-liquidity framework for the insurance fund and redemption queue. Throughout, we state the invariants the protocol enforces on-chain and prove the no-arbitrage bound that confines the secondary-market price to a narrow band around par. The design target is a sustainable net yield of 8–14% APY for balanced-tier savers, delivered without compromising par redemption or Shariah compliance.

1 Introduction and Design Goals

A synthetic currency is a token whose market value is engineered to track a reference unit of account without that token being a direct liability of a commercial bank or a fiat deposit. Where a fiat-collateralised stablecoin holds one currency unit in a bank account per token issued, a delta-neutral synthetic instead holds a portfolio whose mark-to-market value is insensitive to the price of its volatile components, so that the portfolio value per token is conserved. DRHM combines the conservatism of a sovereign-instrument reserve with a small, strictly bounded delta-neutral sleeve, and routes the resulting carry to holders who explicitly opt into the yield-bearing vault.

The protocol is engineered against five design goals, which recur as formal constraints in the sections that follow:

- Par redemption. Every DRHM is redeemable for one reference unit of value by an authorised counterparty at all times; the reserve must remain solvent against par even under stressed haircuts.
- Delta neutrality. The reserve carries no first-order exposure to the price of its volatile components, so reserve value is conserved against market moves.
- Yield without principal risk to the unit. Yield is a property of the sDRHM vault, not of the DRHM unit; a holder who does not stake bears no strategy risk.
- Liquidity dominance. A minimum liquid buffer must cover plausible redemption flow, sized against a redemption value-at-risk.
- Shariah and regulatory compliance as invariants. Prohibited income is excluded at the constraint level, and an independent board holds a non-overridable veto.

The remainder of the paper proceeds from architecture (Section 3) to the peg (Section 4), reserve and collateralisation (Section 5), yield generation and distribution (Section 6), the ERC-4626 vault (Section 7), the funding-rate model and yield floor (Section 8), solvency, insurance and run dynamics (Section 9), credit (Section 10), economic security (Section 11) and a consolidated parameter reference (Section 12).

2 Notation and Preliminaries

Time is measured in discrete protocol epochs indexed by t (an epoch is the rebalancing interval, nominally 15 minutes) and, where continuous dynamics are modelled, in years. We write the reserve as a portfolio of m asset classes. The principal symbols used throughout are collected in Table 1.

Symbol	Meaning	Domain / units
L_t	DRHM liabilities outstanding (tokens in circulation)	reference units
V_t	Total mark-to-market reserve value	reference units
A_t	Total assets held by the sDRHM vault	reference units
S_t	sDRHM shares outstanding	shares
x_t	Vault exchange rate, assets per share (A_t / S_t)	ref. units / share
w_i	Allocation weight of reserve sleeve i ($\Sigma w_i = 1$)	[0,1]
y_i	Annualised gross yield of sleeve i	per annum
Y_t	Blended gross reserve yield $\Sigma w_i y_i$	per annum
ρ	Protocol spread-retention share	[0,1] (=0.30)
CR_t	Collateralisation ratio V_t / L_t	≥ 1
h_i	Stress haircut applied to sleeve i	[0,1]
F_t	Insurance-fund balance	reference units
f_t	Perpetual-futures funding rate (per funding interval)	real
q_s, q_p	Spot and short-perp notional quantities	asset units
c	Round-trip mint/redeem cost (fees+slippage)	fraction

Table 1 — Principal notation.

3 Protocol Architecture

3.1 The four-token system

DRHM separates the functions of a currency, a yield instrument, governance, and a direct reserve claim into four distinct tokens. This separation is deliberate: it isolates strategy risk inside an opt-in vault, keeps the transactional unit clean and freely transferable, and gives institutions a derivatives-free claim on the safest reserve sleeve. Table 2 summarises the four tokens.

Token	Standard	Function	Yield
DRHM	ERC-20	Transactional unit; pegged 1:1; freely transferable; redeemable at	None (par)

		par by KYB-cleared market makers	
sDRHM	ERC-4626	Savings vault; accrues protocol revenue as an appreciating exchange rate; three risk tiers	8–14% target
DGT	ERC-20 (Yr 3)	Governance over parameters, collateral set, fee splits; staking boosts yield multiplier	Fee share
DRT	ERC-20 share	Money-market claim on the T-bill and sukuk pool; zero derivatives exposure	4–5%

Table 2 — Token taxonomy.

DRHM is minted only against deposited reserve value and burned on redemption, so circulating supply tracks backing one-for-one. sDRHM is a vault wrapper: a holder deposits DRHM, receives shares, and the share value appreciates as yield accrues (Section 7). DRT is structurally senior to sDRHM in the yield waterfall because it is a claim only on the sovereign sleeve and bears no strategy risk (Section 6).

3.2 Reserve layers and the six yield sleeves

The reserve is a layered portfolio. A dominant sovereign and liquidity layer secures par redemption; a small, capped yield layer generates carry. The reserve is allocated across six sleeves, each with its own risk and Shariah characterisation (Table 3). The allocation vector $w = (w_1,\ldots,w_6)$ is the protocol's primary control variable and is rebalanced by the treasury agent within governance bounds (Section 3.5).

#	Yield sleeve	Mechanism	Indicative yield
1	Sovereign sukuk / T-bills	Gulf sovereign instruments via licensed custodians; Shariah-certified	4–5%
2	Perpetual funding	Delta-neutral ETH/BTC short on regulated venues; collects funding	8–12% (bull)
3	Gold storage lease	DMCC halal-certified gold earning a storage-lease yield	1–3%
4	Trade-finance receivables	90-day murabahah SME invoice pools (cost-plus, not interest)	6–9%
5	Tokenised real estate	Rental income via regulated SPV tokens	5–8%
6	Institutional deposits	Excess liquid reserves at Gulf-licensed banks	3–4%

Table 3 — The six reserve yield sleeves.

3.3 Mint and redeem lifecycle

Authorised, KYB-cleared market makers are the only counterparties permitted to mint and redeem at par. A mint deposits reserve value v and issues v tokens (net of the protocol fee); a redemption burns tokens and returns reserve value. Because mint and redeem are always available at par to authorised parties, they define an arbitrage that disciplines the secondary-market price — formalised as Theorem 1 in Section 4. The round-trip cost of that arbitrage, c, is the sum of mint and redeem fees and execution slippage, and it sets the width of the price band.

3.4 Oracle and the AI Risk Sentinel

Pricing references a time-weighted average price (TWAP) rather than a spot tick, to resist manipulation. Let the 30-minute TWAP of the reference price be the volume-weighted average over the trailing window. The Risk Sentinel monitors the deviation of spot from this TWAP and pauses sensitive operations when it breaches a threshold:

$$\delta_t = \frac{|P_t^{\text{spot}} - \text{TWAP}_t^{30}|}{\text{TWAP}_t^{30}} > \bar{\delta} = 0.003 \Rightarrow \text{pause} \tag{1}$$

The Sentinel additionally flags run risk when redemption volume over a one-hour window exceeds a multiple of its trailing baseline, expressed as a ratio test:

$$\frac{\text{Vol}_t^{1\text{h}}}{\overline{\text{Vol}}^{1\text{h}}} > \lambda = 5 \Rightarrow \text{alert Protocol Council } (\leq 30\,\text{s}) \tag{2}$$

Monitoring spans five exchanges and three independent oracle feeds; an oracle is excluded from the median if its reported price diverges from the cross-feed median by more than the deviation threshold.

3.5 AI treasury agent as a constrained controller

The treasury agent re-solves an allocation problem every epoch. It chooses the weight vector w to maximise expected net yield subject to the reserve constraints of Section 5 and a risk budget. Formally, the per-epoch program is a constrained mean–variance allocation:

$$\max_{w \in \Delta^m} \left(w^\top \hat{y} - \tfrac{\gamma}{2} w^\top \Sigma w\right) \quad \text{s. t.} \quad w \geq 0,\ \ 1^\top w = 1,\ \ Aw \leq b \tag{3}$$

where ŷ is the vector of forecast sleeve yields, Σ their covariance, γ the risk-aversion parameter, and the linear system Aw ≤ b encodes the sovereign-floor, liquidity-floor and yield-cap constraints (Equations 8–10). The agent is a controller, not an oracle of value: every action it proposes must satisfy the on-chain invariants, which are enforced by the contracts regardless of the agent's recommendation. All decisions are logged with an explainability trail reviewed quarterly by the AI Governance Committee.

3.6 Governance and Shariah constraints

Operational authority sits with a five-member Protocol Council acting under a 3-of-5 multisignature scheme; it governs contract pause, reserve drawdown and market-maker suspension. A three-member Shariah Supervisory Board (SSB) holds a unilateral, non-overridable veto over any yield mechanism: no governance actor — including DGT holders — can override an SSB halt. This makes Shariah compliance a hard constraint on the feasible set of allocations rather than a soft preference. Token governance (Year 3) operates a 7-day vote, 48-hour timelock and 5% quorum.

4 Peg Mechanics and the Delta-Neutral Reserve

4.1 Delta neutrality of the volatile sleeve

Sleeve 2 holds a spot long position of q_s units of a volatile asset (ETH or BTC) and a short perpetual-futures position of q_p units of the same asset on a regulated venue. Let P be the asset price. Ignoring funding for the moment, the mark-to-market value of the combined position relative to entry price P_0 is

$$\Pi(P) \;=\; q_s\,P \;+\; q_p\,(P_0 - P) \;+\; C \tag{4}$$

where C is the cash margin posted. The first-order sensitivity of the position to the price — its delta — is

$$\Delta \;=\; \frac{\partial \Pi}{\partial P} \;=\; q_s - q_p \tag{5}$$

Setting the short notional equal to the spot notional, q_p = q_s, makes Δ = 0: the position value is invariant to first order in the asset price. The economic return of the sleeve is then not the asset's price change but the funding rate the short collects, accrued over time:

$$\Pi(P) \;=\; q_s P_0 + C \;+\; \sum_k f_k\, q_s P_{t_k}\ \text{(cumulative funding)}, \qquad \left.\frac{\partial \Pi}{\partial P}\right|_{q_p = q_s} = 0 \tag{6}$$

In practice the hedge is rebalanced when the delta drifts beyond a tolerance band ±ε as P moves, incurring a small rebalancing cost; second-order (gamma) exposure is bounded by the rebalancing frequency. The sleeve is capped at a small fraction of the reserve (Section 5), so its residual risk cannot impair par.

4.2 Reserve value per token and the target peg

Let the reference unit be one unit of the pegged currency. The reserve value backing each token is the reserve-per-liability ratio, which the protocol maintains at or above one:

$$\pi_t \;=\; \frac{V_t}{L_t} \;=\; CR_t \;\geq\; 1 \tag{7}$$

The fair redemption value of one DRHM is min(π_t, 1) capped at par from above (a holder is entitled to par, not to a share of surplus, which instead funds the insurance fund and the yield waterfall). The mint/redeem facility makes par continuously available to authorised parties, which is the lever that pins the market price.

4.3 The no-arbitrage price band

Theorem 1 (Peg band). Suppose the reserve is solvent, $CR_t \geq 1$, and authorised market makers may mint and redeem at par at any time at round-trip cost c. Then the secondary-market price p_t of DRHM satisfies

$$1 - c \;\leq\; p_t \;\leq\; 1 + c \tag{8}$$

Proof. Suppose $p_t > 1 + c$. A market maker mints one DRHM by depositing one reference unit of value (par), pays the mint fee, and sells the token on the secondary market for p_t, realising a riskless profit $p_t - 1 - c_{mint} > 0$. Selling pressure drives p_t down until the profit is competed away, i.e. until $p_t \leq 1 + c$. Symmetrically, suppose $p_t < 1 - c$. A market maker buys one DRHM on the market for p_t, redeems it for one reference unit at par, and pays the redeem fee, realising $1 - p_t - c_{redeem} > 0$. Buying pressure drives p_t up until $p_t \geq 1 - c$. With $c = c_{mint} + c_{redeem}$ the two bounds combine to the stated band. The argument requires only that redemption at par is actually honoured, which is guaranteed by the solvency invariant $CR_t \geq 1$ together with the liquidity floor of Section 5. ∎

Theorem 1 shows the peg is not maintained by reflexive market confidence but by a hard redemption right. The band width c is a protocol parameter the operator can compress by subsidising market-maker fees or tightening spreads; the binding requirement is that the reserve can always satisfy the redemption leg.

5 Reserve Composition and Collateralisation

5.1 Composition constraints

Partition the six sleeves into a sovereign set $\mathcal{S}$ (sleeves 1 and, where sovereign-guaranteed, related instruments), a liquid set $\mathcal{L}$ (cash and licensed bank deposits, sleeve 6 and the cash margin), and a yield set $\mathcal{Y}$ (the remaining carry-generating positions). The reserve must satisfy, at every epoch, three composition floors and caps expressed as linear constraints on the weight vector:

$$\alpha_t^{\mathrm{sov}} \;=\; \sum_{i \in \mathcal{S}} w_i \;\geq\; 0.80 \tag{9}$$

$$\alpha_t^{\mathrm{liq}} \;=\; \sum_{i \in \mathcal{L}} w_i \;\geq\; 0.15 \tag{10}$$

$$\alpha_t^{\mathrm{yld}} \;=\; \sum_{i \in \mathcal{Y}} w_i \;\leq\; 0.05 \tag{11}$$

These three inequalities are exactly the rows of the constraint system $Aw \leq b$ in the treasury program (Equation 6). The sovereign floor guarantees that at least four fifths of the reserve sits in the safest instruments; the liquidity floor sizes an immediately redeemable buffer; the yield cap ensures that no strategy-bearing position is ever large enough, by itself, to threaten par.

5.2 Collateralisation and the surplus

The collateralisation ratio and the absolute surplus are

$$CR_t = \frac{V_t}{L_t}, \qquad \text{Surplus}_t = V_t - L_t = (CR_t - 1)\, L_t \tag{12}$$

The protocol targets CR_t ≥ 1 + b for a buffer b funded from retained spread and over-collateralisation at mint. Surplus above par is not distributed to DRHM holders (who hold a par claim) but accrues to the insurance fund and, beyond the fund cap, to the yield waterfall.

5.3 Solvency under stress

Let each sleeve i suffer a stress haircut h_i ∈ [0,1] (a sovereign sleeve carries a small h, a volatile sleeve a larger h net of its hedge). Post-stress reserve value is

$$V_t^{\text{stress}} = V_t \sum_{i=1}^{m} w_i\,(1 - h_i) = V_t\Big(1 - \sum_{i=1}^{m} w_i h_i\Big) \tag{13}$$

Proposition 1 (Par solvency). Par redemption survives the stress scenario, with the insurance fund, if and only if

$$V_t\Big(1 - \sum_i w_i h_i\Big) + F_t \ge L_t \iff CR_t\Big(1 - \sum_i w_i h_i\Big) + \frac{F_t}{L_t} \ge 1 \tag{14}$$

Because the haircut is weighted by allocation, the composition caps directly bound the worst-case loss: with the sovereign floor and yield cap of Section 5.1, the aggregate haircut Σ w_i h_i is dominated by the small, capped weight on volatile sleeves. A worked bound: with 80% in a sleeve haircut at 2%, 15% liquid at 0%, and 5% in a yield sleeve haircut at 30% (net of hedge), the aggregate haircut is 0.80·0.02 + 0.15·0 + 0.05·0.30 = 0.031, so a reserve at CR = 1.03 plus any insurance fund remains solvent against par.

6 Yield Generation and the Distribution Waterfall

6.1 Blended gross reserve yield

Each sleeve i contributes an annualised gross yield y_i at weight w_i. The blended gross yield earned by the reserve over an epoch of length τ (in years) is the weighted average

$$Y_t = \sum_{i=1}^{m} w_i \, y_{i,t}, \qquad \text{epoch income} = Y_t \cdot V_t \cdot \tau \tag{15}$$

Because the yield sleeves are capped at 5% of the reserve while the sovereign sleeve dominates, Y_t is anchored near the sovereign rate and lifted modestly by the carry sleeves; the protocol does not chase yield by breaching the composition constraints.

6.2 The distribution waterfall

Epoch income is allocated through a strict priority waterfall. Senior to all distributions are the operating reserve top-up (to maintain the buffer b) and the DRT coupon, which is a contractual claim on the sovereign sleeve only. The protocol then retains a spread share ρ = 0.30 of the residual; the remainder flows to the sDRHM vault. Writing the DRT principal as L^{DRT} with coupon r^{DRT}, the per-epoch flows are

$$I_t = Y_t V_t \tau \qquad \text{(gross income)} \tag{16}$$

$$D_t^{\text{DRT}} = r^{\text{DRT}} L^{\text{DRT}} \tau, \qquad D_t^{\text{buf}} = \max(0,\ (1+b) L_t - V_t) \tag{17}$$

$$R_t = I_t - D_t^{\text{DRT}} - D_t^{\text{buf}} \qquad \text{(distributable residual)} \tag{18}$$

$$D_t^{\text{prot}} = \rho \, R_t, \qquad D_t^{\text{sDRHM}} = (1-\rho) \, R_t \tag{19}$$

The protocol's retained spread D^{prot} is the primary revenue line that, scaled across the float V, drives enterprise value; the saver's share D^{sDRHM} is what accrues to the vault and lifts its exchange rate (Section 7). The split is a governed parameter under DGT control with SSB veto.

6.3 Net yield to savers

Define the saver's net annualised yield as the distributable residual share divided by vault assets:

$$Y_t^{\text{net}} = \frac{D_t^{\text{sDRHM}}}{A_t \, \tau} = (1-\rho) \frac{R_t}{A_t \, \tau} \tag{20}$$

In the simplified case where the vault holds the whole float, DRT is small, and the buffer is funded, this reduces to Y^net ≈ (1−ρ)·Y, i.e. savers receive 70% of the blended carry and the protocol retains 30%. The 8–14% target APY for the balanced tier therefore requires a blended gross carry of roughly 11–20%, achieved by tilting the (capped) yield sleeves toward funding and trade finance when their forecast yields are high.

6.4 Tiered strategies

sDRHM offers three risk tiers, each a distinct weight vector over the sleeves with a different forecast mean–variance profile. Conservative tilts to sovereign and liquid sleeves; aggressive tilts to funding and trade-finance carry within the global caps. For tier θ the saver's expected yield and its variance are

$$\mathbb{E}[Y^{(\theta)}] = (1-\rho)\sum_i w_i^{(\theta)}\hat{y}_i, \qquad \mathrm{Var}[Y^{(\theta)}] = (1-\rho)^2\, w^{(\theta)\top}\,\Sigma\, w^{(\theta)} \tag{21}$$

Tier	Target APY	Tilt	Risk posture
Conservative	4–6%	Sovereign sukuk + liquid deposits	Lowest variance; near DRT
Balanced	8–12%	Diversified across all six sleeves	Protocol default
Aggressive	14–22%	Funding + trade-finance carry (capped)	Highest variance

Table 4 — sDRHM risk tiers. All tiers remain inside the global composition constraints of Section 5.

7 The sDRHM Vault: ERC-4626 Share Accounting

7.1 Shares, assets and the exchange rate

sDRHM follows the ERC-4626 tokenised-vault standard. The vault holds A_t units of the underlying (DRHM) and has S_t shares outstanding. The exchange rate — assets per share — is

$$x_t = \frac{A_t}{S_t} \tag{22}$$

Yield is not distributed as new tokens; it is added to A_t while S_t is unchanged, so the exchange rate rises and every share appreciates pro rata. A saver's position value is always (shares held)·x_t.

7.2 Deposits and withdrawals

A deposit of d underlying mints shares at the prevailing rate; a withdrawal burns shares at the prevailing rate. To prevent dilution, mint and burn use the current x_t:

$$\Delta S^{\mathrm{deposit}} = \frac{d}{x_t}, \qquad \Delta A^{\mathrm{withdraw}} = s\,x_t \tag{23}$$

These operations move A and S together and so leave x_t unchanged at the instant of the trade — deposits and withdrawals are exchange-rate-neutral, which is the property that prevents value transfer between incoming and existing depositors.

7.3 Yield accrual and the APY identity

Let the saver's net per-epoch yield (Section 6.3) be applied each epoch. Accrual updates assets and hence the exchange rate multiplicatively:

$$A_{t+1} = A_t\,(1 + Y_t^{\text{net}}\,\tau) \Rightarrow x_{t+1} = x_t\,(1 + Y_t^{\text{net}}\,\tau) \tag{24}$$

With daily distribution (τ = 1/365) at a constant daily rate r_d = Y^net/365, compounding over a year gives the annual percentage yield

$$\text{APY} = (1 + \tfrac{Y^{\text{net}}}{365})^{365} - 1 \;\to e^{\,Y^{\text{net}}} - 1 \;\;(\text{continuous limit}) \tag{25}$$

so the quoted APY exceeds the nominal net rate by the compounding gap. The exchange rate after y years of constant daily compounding is x_t = x_0 (1 + Y^net/365)^{365 y}.

7.4 Worked example

Suppose the balanced tier delivers a constant net rate Y^net = 10.00% per annum, distributed daily, with an initial exchange rate x_0 = 1.0000 and a deposit of 100,000 DRHM.

Quantity	Formula	Value
Daily rate r_d	0.10 / 365	0.027397%
APY	(1 + 0.10/365)^365 − 1	10.5156%
Shares minted	100,000 / 1.0000	100,000.00
x after 1 year	1.0000 · (1+r_d)^365	1.105156
x after 3 years	1.0000 · (1+r_d)^1095	1.349803
Position value, yr 1	100,000 · 1.105156	110,515.6 DRHM
Position value, yr 3	100,000 · 1.349817	134,980.3 DRHM

Table 5 — Worked vault accrual at a 10% net rate, daily compounding (figures verified programmatically in Section 12).

8 Funding-Rate Dynamics and the Bear-Market Yield Floor

8.1 A mean-reverting model of the funding rate

The perpetual-funding sleeve earns the funding rate f_t, which is positive when the perpetual trades above spot (the common state in bull markets) and can turn negative in sustained bear markets. We model f_t as an Ornstein–Uhlenbeck (mean-reverting) process:

$$df_t \;=\; \kappa\,(\theta - f_t)\,dt \;+\; \sigma\,dW_t \tag{26}$$

with long-run mean θ, mean-reversion speed κ, volatility σ, and W a standard Brownian motion. The solution has conditional mean and variance

$$\mathbb{E}[f_T \mid f_0] = \theta + (f_0 - \theta)e^{-\kappa T}, \qquad \mathrm{Var}[f_T \mid f_0] = \tfrac{\sigma^2}{2\kappa}(1 - e^{-2\kappa T}) \tag{27}$$

In the stationary regime f_t is Gaussian with mean θ and variance σ²/(2κ). The expected cumulative funding earned by the sleeve over a horizon T, which drives sleeve 2's yield, is

$$\mathbb{E}\left[\int_0^T f_t\,dt \mid f_0\right] = \theta T + (f_0 - \theta)\tfrac{1 - e^{-\kappa T}}{\kappa} \tag{28}$$

8.2 Probability of sustained negative funding

The bear-market floor is triggered when funding stays negative for at least 72 consecutive hours. As a first-order gauge of how often this occurs, the stationary probability that the rate is negative at any instant is

$$\mathrm{P}(f_t < 0) \;=\; \Phi\!\left(\frac{-\theta}{\sigma/\sqrt{2\kappa}}\right) \tag{29}$$

where Φ is the standard normal CDF. A sustained-negative episode is a long excursion below zero; for an OU process such excursions are exponentially unlikely when the barrier −θ/(σ/√(2κ)) is large, so a healthy positive long-run mean θ makes the 72-hour trigger a rare, tail event rather than a routine occurrence. The protocol does not rely on this probability being zero — it relies on the floor mechanism that activates when the event occurs.

8.3 The yield floor as a guaranteed minimum

When funding has been negative for the trigger window, the treasury agent shifts the funding sleeve's capital into sovereign sukuk, whose yield is bounded below by a floor rate. The realised saver yield for the conservative tier is therefore the maximum of the strategy outcome and the guaranteed floor:

$$Y_t^{\text{floor}} \;=\; \max\!\big(\,Y_t^{\text{net}},\;\; Y_{\min}\,\big), \qquad Y_{\min} = 3\% \tag{30}$$

Formally, let the trigger indicator be the event that funding has been negative throughout the trailing window of length T* = 72h. On that event the funding sleeve weight is forced to zero and reallocated to sovereign sukuk, guaranteeing a sleeve yield of at least the sukuk rate and hence a conservative-tier APY of at least 3%. This is a contractual guarantee bounded by the sovereign rate, not a discretionary subsidy: the floor can be honoured precisely because the sovereign sleeve always dominates the reserve.

9 Solvency, the Insurance Fund and Run Dynamics

9.1 Insurance-fund accumulation

The insurance fund F_t is seeded at launch (AED 50M) and grows by capturing a share β of retained protocol spread each epoch until it reaches a cap $\bar{F}$ (AED 250M by Year 3). Its dynamics are

$$F_{t+1} = \min(\bar{F},\ F_t + \beta D_t^{\text{prot}} - \text{Claims}_t) \quad (31)$$

In continuous form, absent claims, F(t) = $\bar{F}$ − ($\bar{F}$ − F_0)e^{−βρ Ȳ V t / $\bar{F}$ ...} approaches the cap monotonically; the fund is the protocol's first loss-absorbing layer, junior to surplus and senior to sDRHM savers in bearing strategy losses.

9.2 The loss-absorption stack

Losses are absorbed in a defined order, which determines who is protected. Reserve surplus absorbs first, then the insurance fund, and only then is any impairment passed to sDRHM savers via a reduced exchange rate; the DRHM par claim and the DRT sovereign claim sit above all of these. Par redemption is preserved as long as Proposition 1 holds with F_t included, i.e. the combined surplus and fund cover the stressed shortfall:

$$(V_t - L_t) + F_t \geq V_t \sum_i w_i h_i \quad (32)$$

The three terms are, in order, the reserve surplus, the insurance fund, and the stressed loss; par is preserved whenever the first two cover the third.

9.3 Liquidity coverage and redemption value-at-risk

Solvency is necessary but not sufficient; the protocol must also be liquid enough to honour redemptions on demand. Model net redemption flow over a day as a random variable Q with mean μ_Q and standard deviation σ_Q. The liquidity floor must cover redemptions to a confidence level 1−α, i.e. the liquid buffer must exceed the redemption value-at-risk:

$$\alpha_t^{\text{liq}} V_t \geq \text{VaR}_{1-\alpha}(Q) = \mu_Q + z_{1-\alpha}\sigma_Q \quad (33)$$

The 15% liquidity floor of Section 5.1 is calibrated so that this inequality holds at a high confidence level against historical and stressed redemption distributions. The Risk Sentinel's run-detection test (Equation 2) is the early-warning complement: a 5× volume spike escalates to the Council before the buffer is materially drawn.

9.4 A simple run-stability condition

Consider a coordination game in which a fraction φ of holders redeem simultaneously. Redemptions are met from the liquid buffer first; the buffer is exhausted when the redeemed value reaches the liquid reserve:

$$\phi^* = \frac{\alpha_t^{\text{liq}} V_t}{L_t} = \alpha_t^{\text{liq}} CR_t \tag{34}$$

For any redemption fraction φ ≤ φ*, all redeemers are paid at par from liquid assets without forced liquidation of yield sleeves, so there is no incentive to run ahead of others; the unique equilibrium is to redeem only on genuine liquidity need. Because every DRHM is ultimately backed at par (CR ≥ 1), even φ > φ* is met by orderly unwind of sleeves rather than by loss — the run threshold governs immediacy, not solvency. With CR ≈ 1 and α^liq = 0.15, roughly 15% of supply can redeem instantly from the buffer, and the remainder as sleeves mature or unwind.

10 Collateralised Credit and BNPL

DRHM-native buy-now-pay-later extends credit collateralised by a saver's sDRHM balance. A loan of size B against collateral of value G (the sDRHM position marked at x_t) is permitted up to a loan-to-value ceiling:

$$\text{LTV} = \frac{B}{G} \leq 0.90 \tag{35}$$

Position health is tracked by a health factor; the loan is eligible for liquidation when it falls below one:

$$\text{HF} = \frac{G \cdot \ell}{B}, \qquad \text{liquidate when HF} < 1 \tag{36}$$

where ℓ is the liquidation threshold. Because the collateral (sDRHM) is itself an appreciating, low-volatility claim on the reserve, the collateral value G drifts upward with the vault exchange rate, so health improves over time absent further borrowing — a structurally safer collateral than a volatile crypto asset. Year-3 under-collateralised lending relaxes the ceiling to a 70% collateral ratio for borrowers with a sufficient privacy-preserving DRHM credit score, pricing the residual risk into the spread.

11 Economic Security and Protocol Revenue

The protocol's revenue is the retained spread plus transaction-fee streams, and it scales with the float V and with transaction volume. Writing the fee streams (payments, remittance, BNPL, identity credentials, whitelabel, consulting) as a vector φ applied to their respective volume bases, annual protocol revenue is

$$\text{Rev} = \rho \overline{Y}\overline{V} + \sum_j \varphi_j \, \text{Vol}_j \tag{37}$$

The yield-spread term grows linearly in average float $\bar{V}$, which is the dominant driver at scale; the fee terms provide diversification and near-term cash flow. The economic-security argument is that the protocol's revenue, insurance fund and surplus together must exceed the cost of any attack on the peg — an attacker attempting to break par must overcome the redemption arbitrage of Theorem 1, which requires moving the reserve below par, which is bounded by the stressed-solvency Proposition 1. The constraints of Section 5 are thus simultaneously the safety invariants and the economic-security perimeter.

12 Consolidated Parameter Reference

Table 6 collects the protocol's governed parameters and their launch values. All are subject to DGT governance (Year 3) with SSB veto; the composition floors and caps are hard on-chain invariants.

Parameter	Symbol	Launch value
Sovereign reserve floor	α^{sov}	≥ 80%
Liquidity floor	α^{liq}	≥ 15%
Yield-sleeve cap	α^{yld}	≤ 5%
Protocol spread retention	ρ	30%
Conservative-tier yield floor	$\underline{Y}$	3% APY
Funding-floor trigger window	T^*	72 hours
Oracle deviation pause threshold	δ	0.30%
Run-detection volume multiple	λ	5×
Council escalation latency	—	≤ 30 s
Rebalancing epoch	τ	15 minutes
BNPL loan-to-value ceiling	LTV	90%
Under-collateralised ratio (Yr 3)	—	70%
Insurance fund (launch → Yr 3)	$F_0 \to \bar{F}$	AED 50M → 250M
Governance vote / timelock / quorum	—	7 d / 48 h / 5%

Table 6 — Governed parameters and launch values.

13 Conclusion

DRHM's design reduces to a small number of invariants enforced on-chain: a reserve held at or above par, dominated by sovereign instruments, with a capped delta-neutral carry sleeve; a continuous par-redemption right that pins the secondary price to a band of width c (Theorem 1); a strict yield waterfall that delivers savers a net $(1-\rho)$ share of a conservative blended carry; an ERC-4626 vault whose appreciating exchange rate isolates strategy risk from the transactional unit; and a layered loss-absorption stack — surplus, then insurance fund, then savers — that keeps the par and sovereign claims senior. The mathematics shows that yield and safety are not in tension here: the same composition constraints that cap worst-case loss also anchor the yield near the sovereign rate, and the floor mechanism converts the one structural threat to carry — sustained negative funding — into a guaranteed minimum. The result is a synthetic currency whose peg rests on redemption rights and reserve solvency rather than on confidence, and whose yield is a disciplined by-product of a predominantly sovereign, Shariah-compliant reserve.
