# Research on ASMR

## *Part 2. Efficient liquidity in dTAO: a continuous liquidity feedback loop*

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### HOW FAST SHOULD EXCESS LIQUIDITY TURN BACK INTO PRICE?

Building on the Exploit Summit talk, Montreal, September 29, 2026.

## RESEARCH SUMMARY

Part 1 of this research showed that subnet pools hold 1.97 million TAO, 61% of everything emitted since dTAO launched, and far more depth than their trading needs. That depth mutes the Alpha price, the link that turns a subnet's revenue into miner rewards and new capacity. Part 1 built a measure of excess liquidity, the slippage benchmark, and ran a simplified simulation of ASMR (Alpha Subnet Market Reloaded): a one-off transition from liquidity to price that retires the Alpha the protocol injected into the pools and lifts the subnet index 2.3 times.

**Why a one-off transition is not enough.** Emission arrives every day. Part of it is injected as paired depth, and the pools it deepens are often the ones the transition just made shallower. Left alone the pools keep deepening, and a 100,000 TAO buy that lifts Chutes by 123% today would lift it by 103% in two years. What is needed is a feedback loop that keeps matching the supply of liquidity with the demand for it.

A rule that runs continuously raises two questions that a one-off transition can leave aside:

- **Pace.** How fast may the rule turn excess depth back into price without distorting the market it is meant to free?
- **Allocation.** Who receives the TAO that the pools release: the subnet it came from, other subnets, or a protocol vault?

> THESIS. **Efficient liquidity is not maximum liquidity**. When protocol-owned reserves grow faster than trading demand, liquidity stops improving execution and starts suppressing price discovery. Bittensor should choose the market quality it wants and size liquidity to deliver it, rather than letting depth accumulate as a by-product of emission. Liquidity control addresses sizing while curve and settlement design address the boundary. Neither solves both.

**This paper, Part 2 of two:**

- **First**, builds the **feedback loop**: a slippage reading for each pool, a target capped at 2%, a daily pace tied to each pool's own volatility, and a guard on pools where holders' claims are large
- **Then**, **simulates it for two years** on the September 30, 2026 state of the 128 subnets. The base case lifts the subnet index 44% per year in a flat market and holds its fall under persistent selling to 13% per year, against 33% without it
- **Finally**, compares **three uses of the released TAO**, back to the same pool, across subnets or into a vault, with the risks of each, and shows that removing liquidity without returning its value leaves Alpha holders worse off

> HOW TO READ. **This research comes in two papers, released together. Part 1** measures the problem and builds the tools: the diagnosis, the curve designs, the slippage benchmark and a one-off transition experiment. **Part 2, this paper,** develops the continuous feedback loop, simulates it over two years and sets out who could receive the liquidity it releases. It opens with a one-page recap of Part 1 and refers to it for the definitions. Both papers are dense by design. **Readers can give them to their favorite AI agent.**

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# OUTLINE


## 1. RECAP OF PART 1

The problem, the measure and the one-off transition this paper starts from

## 2. BUILDING A CONTINUOUS LIQUIDITY FEEDBACK LOOP

The measure, the rules, the chain and the market, in the order a simulated day runs

## 3. SIMULATION RESULTS

Two years on the September 30, 2026 state, in a flat market and under persistent selling

## 4. LIQUIDITY ALLOCATION, OWNERSHIP, AND ECONOMIC TRADE-OFFS

Who receives the released TAO, the risks, and the vault

## CONCLUSION

## APPENDIX

# 1. RECAP OF PART 1

This paper is the second of two. Part 1 measured the excess liquidity in subnet pools, separated the choice of curve from the quantity of reserves, and built the measure and a simplified simulation of the rule that this paper develops into a feedback loop. The six results below are what the rest of the paper uses, each with the section of Part 1 that establishes it. Readers who know Part 1 can go straight to Section 2.

- **Pools hold more depth than their trading needs** (Part 1, Section 1). Subnet pools hold 1.97 million TAO, 61% of everything emitted since dTAO launched, and about 45% of it sits beyond the reach of any holder. In the ten most liquid pools, liquidity grew 196% since June 2025 while trading fell 61%. A deeper pool is cheaper to trade and harder to move. Price stops rewarding demand, and the flywheel that turns a subnet's revenue into miner rewards and new capacity slows.
- **The cause is how emission is injected** (Part 1, Section 1.2). Most emission has entered the pools as TAO paired with newly created Alpha, 85% since launch and 31% today. The pairing keeps the price where it was and turns the value of emission into depth. No holder earned that injected Alpha, which is why ASMR may retire it. The Alpha that miners, validators and stakers earned is never burned.
- **A curve does not connect liquidity to demand** (Part 1, Section 2). The four curve designs of Part 1 return between 39% and 100% of the reserve at a full sale and respond differently to a trade, but a curve is set once and none of them adjusts liquidity when trading demand changes. A super-elliptic pool keeps the single rule of constant product, adds a finite end, and its exponent gives a way to size depth at a given price.
- **Slippage is the control variable** (Part 1, Section 3.1). Market flow is the daily change in a pool's TAO reserve, net of protocol injection and chain buys. The slippage proxy S divides its 90-day average absolute value F by the reserve, on the worse of the TAO and Alpha sides. The benchmark is the liquidity-weighted average of S across pools. On September 30, 2026 it stands at 1.08%. With a band of 10% around it, 47 pools holding 64% of all pool TAO are over-liquid.

$$S_i = \max\left(\frac{F_{\mathrm{TAO},i}}{\tau_i}, \frac{F_{\mathrm{Alpha},i}}{\alpha_i}\right) \qquad \text{and} \qquad \text{benchmark} = \sum_i w_i S_i, \quad w_i \propto \sqrt{\tau_i \alpha_i}$$

- **Most of today's depth is a subsidy** (Part 1, Section 3.2). At today's 5 bps swap fee a private provider would supply about 7% of today's depth. There is no market level to converge to, so a ceiling has to be chosen, and this paper uses 2%, between the benchmarks that fees of 30 and 50 bps would sustain.
- **A one-off transition shows the size of the effect** (Part 1, Section 3.3). Part 1 tested ASMR in a simplified experiment on the frozen September 30 state: a one-off transition that retires 98 million Alpha the protocol injected and lifts the subnet index (YCX) 2.3 times. On a live chain emission keeps rebuilding the depth that was removed, so the control has to run continuously. Retiring Alpha is the same as releasing TAO and Alpha in proportion and swapping the released TAO back into the pool. This paper builds on that two-step reading, because the released TAO can also go elsewhere.

## 2. BUILDING A CONTINUOUS LIQUIDITY FEEDBACK LOOP

The one-off transition of Part 1 retired Alpha until nothing eligible was left. A live mechanism faces a different problem. Emission arrives every day, part of it is injected as paired depth, and the pools it deepens are often the ones ASMR just made shallower. The feedback-loop version of ASMR therefore runs continuously against a moving target and never finishes. The simulation steps one day at a time, and this section sets out the model in that order (details in the appendix).

### One day of the ASMR feedback loop

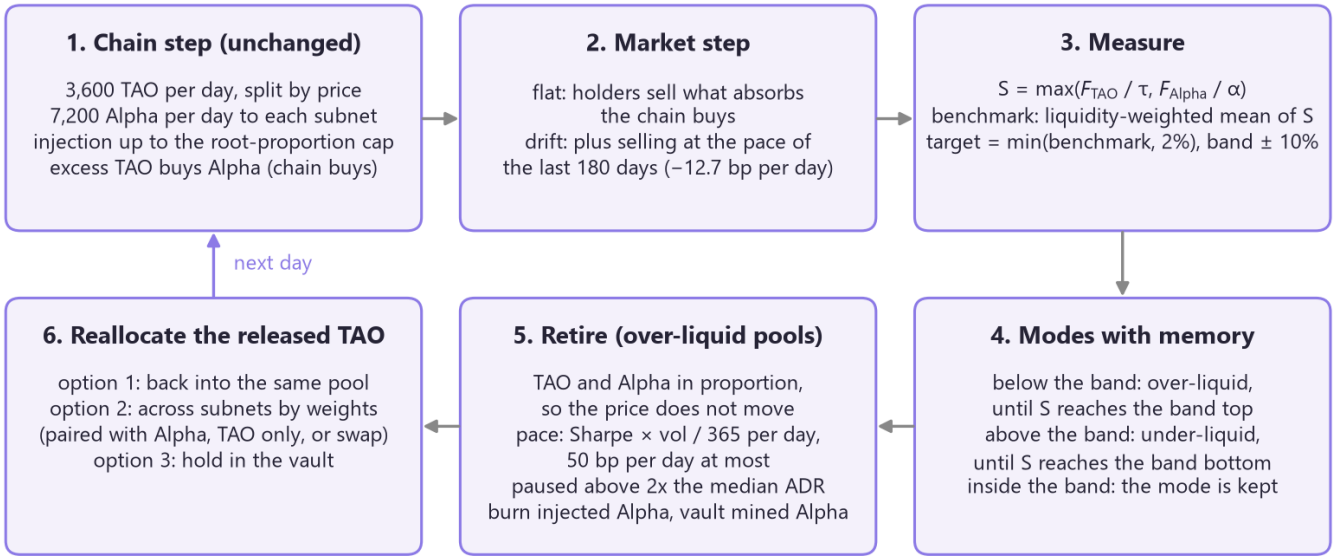


*Figure 1. One simulated day of the ASMR feedback loop. Steps 1 and 2 are the chain and the market. Steps 3 to 6 are the mechanism.*

#### The measure

Each pool's slippage proxy S and the liquidity-weighted benchmark are those of Part 1. The target is the lower of the benchmark and a 2% cap, with a band of plus or minus 10% around it. Market flows stay at their September 30 values, so S moves only when the reserves move. The model does not forecast new trading behavior.

#### The rules

- **Modes with memory.** A pool below the band enters over-liquid mode and stays there until S reaches the top of the band. A pool above the band enters under-liquid mode and stays there until S reaches the bottom. Inside the band it keeps its mode. The memory stops pools from flickering across the line.
- **Retirement: burn first, then vault.** Over-liquid pools retire TAO and Alpha in proportion, so the price does not move at this step. Alpha is burned up to the ownership guardrail, the Alpha the protocol has injected into the pool since its subnet was registered, and is not minted again. Beyond the guardrail it was mined by participants and is vaulted. The TAO goes to a TAO vault pending reallocation.
- **Pacing.** ASMR may lift a pool's price only as fast as that pool already moves. The Sharpe sets the ratio: over a year, the lift cannot exceed the Sharpe times the pool's annualized volatility. At Sharpe 1.5, the base case, a subnet whose price moves 10% per year can be lifted by at most 15% per year, about 0.04% per day. For Chutes, whose volatility is 27% per year, the cap is 11.1 basis points per day. Whatever the volatility, the cap never exceeds 50 basis points per day.
- **ADR guard.** No Alpha is taken out of a pool whose ADR, the staked Alpha held outside the pool divided by the Alpha inside it, exceeds 2 times the network median, until it is back below 1.5 times. The guard keeps ASMR from thinning the Alpha side where holders' claims have grown large against the pool.
- **Reallocation of the TAO vault.** The released TAO can go to three places, set out in Table 1. Every delivery respects the pace, and Section 4 discusses who should receive it.

| Option | Where the released TAO goes | How it is delivered | Who benefits |
|---|---|---|---|
| **1. Same pool** | Back into **the pool it came from** | **A swap buy** in that pool. This is the one-off transition of Part 1, Section 3.3, read in two steps. | **Holders of the subnet** that gave up the depth, through **a higher price** |
| **2. By weights** | Across subnets, by **today's emission shares** or by the holdings of the **Root Reborn validator baskets** | Under-liquid recipients get **TAO paired with vault Alpha** of the same subnet, or TAO alone when the TAO side is the shallow one, up to the bottom of the band. Other recipients get **swap buys** up to the top of the band. | **Recipient subnets**: **depth** for the shallow pools, **price** for the others |
| **3. Vault only** | **Nowhere** for now | The TAO **stays in the vault** and accumulates. | **Nobody yet**. Future uses such as borrowing and lending are left open |

*Table 1. The three options for the TAO that retirement releases.*

- **Vault seed.** The protocol already holds 14.0 million Alpha bought with excess emission TAO (SubnetProtocolAlpha). It is the vault's opening balance, so paired injection is available from day one.
- **Stop.** The simulation stops after two years, or earlier if ASMR is inactive for 30 days. A live loop would keep running.

**The chain**

- **Emission.** 3,600 TAO per day are split across subnets by their shares. Each subnet mints 7,200 Alpha per day to its holders, plus the Alpha injected into its pool, and its Alpha emission halves once its own issuance passes 10.5 million.
- **Shares follow prices.** Each subnet starts at its observed 30-day emission share and then follows the chain's rule: price shares passed through the Hill gate, with per-subnet factors that make day 0 exact.
- **Injection and chain buys.** Alpha injected equals the lower of the subnet's TAO emission at the pool price and the root proportion of its Alpha emission, and the matching TAO is injected with it. The excess TAO buys Alpha from the pool, and that Alpha is credited to the protocol vault. The root proportion falls as the subnet's issuance grows, which moves its emission from injection to chain buys over time. Rising prices work the other way: they turn chain buys into injection, so a pool that ASMR reprices receives more paired depth the next day.

**Two market scenarios**

- **Flat market, base case.** Holders sell exactly what absorbs the chain buys, so emission leaves every price unchanged, and they never sell into the lift ASMR causes. This is an accounting device: if holders sold into the lift, part of the price gain would turn into TAO paid to sellers, as the drift market shows.
- **Drift market.** Flat market plus uniform selling of a fixed share of staked outside Alpha per day, sized so that the no-ASMR baseline reproduces the realized drift of the YCX index over the last six months (180 days), −12.7 basis points per day. The same selling moves a shallower pool more. A mechanism that removes liquidity without returning value therefore leaves holders worse off, as Section 3 shows.

**Not modeled**

- Profit-taking beyond what the ADR guard anticipates, buyers who front-run the lift, gaming of the metric, swap fees and trading on other venues.
- Miner-burn scaling, root dividends in the emission split, changes to root stake or to the chain's parameters, and deregistrations: the runs keep all 128 subnets.

The engine shows how the same TAO splits between depth and price under each rule. It does not simulate how traders would respond.

> KEY INSIGHT. **With emission running, the loop never finishes.** Injection keeps rebuilding depth in the pools ASMR drains, and the faster those pools reprice, the more of their emission comes back as injection. ASMR has no end date. It runs continuously, and the decision that matters is how fast it may turn excess depth back into price.

## 3. SIMULATION RESULTS

We run every version for two years from the September 30, 2026 state of the 128 subnets, in two markets. In the flat market, prices move only if ASMR moves them. In the drift market, holders keep selling at the pace of the last six months, a stress case that takes the YCX index down 33% per year without ASMR. Results are annual rates of change from the September 30 level. In the flat market the pools keep getting deeper without ASMR: the benchmark falls from 1.08% to 0.88% in two years.

| # | Variant | YCX per year | Chutes per year | YCX per year, drift | Chutes per year, drift | Locked TAO, end | Reachable TAO, end | Benchmark, end |
|---|---|---|---|---|---|---|---|---|
| 1 | Option 1, Sharpe 1 | +30% | +31% | -20% | -5% | 558K | 2,101K | 1.16% |
| **2** | **Option 1, Sharpe 1.5 (base case)** | **+44%** | **+50%** | **-13%** | **+3%** | **486K** | **2,263K** | **1.31%** |
| 3 | Option 1, Sharpe 2 | +57% | +71% | -7% | +11% | 433K | 2,403K | 1.46% |
| 4 | Option 2, emission weights | +30% | +47% | -13% | +1% | 524K | 2,082K | 1.21% |
| 5 | Option 2, top-10 validator baskets | +27% | +34% | -17% | -9% | 558K | 2,067K | 1.07% |
| 6 | Option 3, vault only | 0% | 0% | -36% | -23% | 459K | 1,358K | 1.17% |
| **7** | **Single-step super-elliptic, option 1** | **+58%** | **+50%** | **-14%** | **-15%** | | | **1.57%** |
| 8 | Single-step super-elliptic, option 2 (baskets) | +54% | +50% | -14% | -24% | | | 1.78% |
| 9 | No ASMR, protocol flows only | +103% | +49% | | | 769K | 3,831K | 1.27% |
| 10 | No ASMR, all flows | 0% | 0% | -33% | -21% | 812K | 1,709K | 0.88% |

*Table 2. Annual price change over the two-year runs, from the September 30, 2026 level. Options 2 and 3 run at Sharpe 1.5. Rows 7 and 8 start with a single-step move to super-elliptic pools. The last three columns are the end of the flat-market run, against 888K locked TAO, 1,084K reachable TAO and a 1.08% benchmark at the start.*

**What the simulations show**

- **The pace sets the price.** Many of the large over-liquid pools move at their cap every day. Chutes is the example: 27% annual volatility times 1.5 gives 40% per year, 11.1 basis points per day, which compounds to 50%. The index rises 30% per year at Sharpe 1, 44% at 1.5 and 57% at 2. Without the ADR guard, one small pool would rise 30 times in two years and take the index to 55% per year.
- **The loop refills the pools it drains.** Higher prices turn chain buys into injection: 1,007 TAO per day by the end of the run, against 417 without ASMR. ASMR keeps releasing against it, 1,033 TAO per day at the end of the run, so the loop never finishes. Locked TAO still falls from 888K to 486K.
- **Option 2 spreads the TAO, and shallow pools get depth.** With emission weights, 73% of the released TAO goes back as swap buys to pools that are not short of depth, because the subnets with the most emission are also the deepest. The index rises 30% per year, below option 1. Validator baskets send more to small pools: the index rises 27% per year and paired depth reaches 164K TAO, against 139K. Paired depth leaves the price unchanged, and it is possible because the protocol already holds Alpha of those subnets.
- **Prices move apart, and emission follows only a little.** After two years the index stands at 2.1 times its starting level, while pools with nothing to retire have not moved. The top ten subnets go from 62% to 68% of daily TAO emission.
- **A single-step migration cuts depth on day one.** Rows 7 and 8 move the 47 over-liquid pools to their target on the first day, 32 of them onto super-elliptic curves. This releases 781K TAO at once and lifts the benchmark from 1.08% to 1.49% in a day. The released TAO comes back only at the pace, and half of it is still waiting after two years. The pools that were cut therefore suffer when holders sell: Chutes falls 15% per year in the drift market, against a rise of 3% in the base case.

**Breakout potential**

What happens when a subnet attracts real demand? We take the 100K TAO buy of Part 1, Section 1.1 and place it after two years in the flat market (Table 3).

- **With ASMR the price after the same buy is more than twice as high.** It takes Lium to 5.4 times today's price, against 2.2 times without ASMR, and Chutes to 4.4 times against 2.0. Without ASMR, Lium would need a 280K TAO buy to get there.
- **The gain is the price ASMR has already returned**, 2.24 times on Chutes. The buy then adds about as much as before, because under option 1 the TAO stays in the pool.

- **Doing nothing makes pools harder to move.** Injection keeps adding depth, so the buy that lifts Chutes 123% today lifts it 103% in two years.
- **Vault-only makes pools the most sensitive but returns no price.** The buy lifts Chutes 162% from an unchanged price, to 2.6 times today's level.

| Version | Chutes, price from ASMR | A 100K TAO buy adds | Price after both, against today | Ten largest pools, median price | A 100K TAO buy adds |
|---|---|---|---|---|---|
| Today | 1.00x | +123% | 2.2x | 1.00x | +425% |
| No ASMR, after two years | 1.00x | +103% | 2.0x | 1.00x | +330% |
| **Option 1, Sharpe 1.5 (base case)** | **2.24x** | **+96%** | **4.4x** | **2.13x** | **+314%** |
| Option 2, emission weights | 2.16x | +99% | 4.3x | 2.03x | +220% |
| Option 3, vault only | 1.00x | +162% | 2.6x | 1.00x | +570% |
| **Single-step super-elliptic, option 1** | **2.24x** | **+106%** | **4.6x** | **2.44x** | **+318%** |

*Table 3. Breakout potential after two years in the flat market. Price from ASMR is the price multiple each version delivers from September 30, 2026. The buy is 100K TAO into the pool on its end state, along its own curve. The last two columns take the median over the ten largest pools by TAO reserve.*

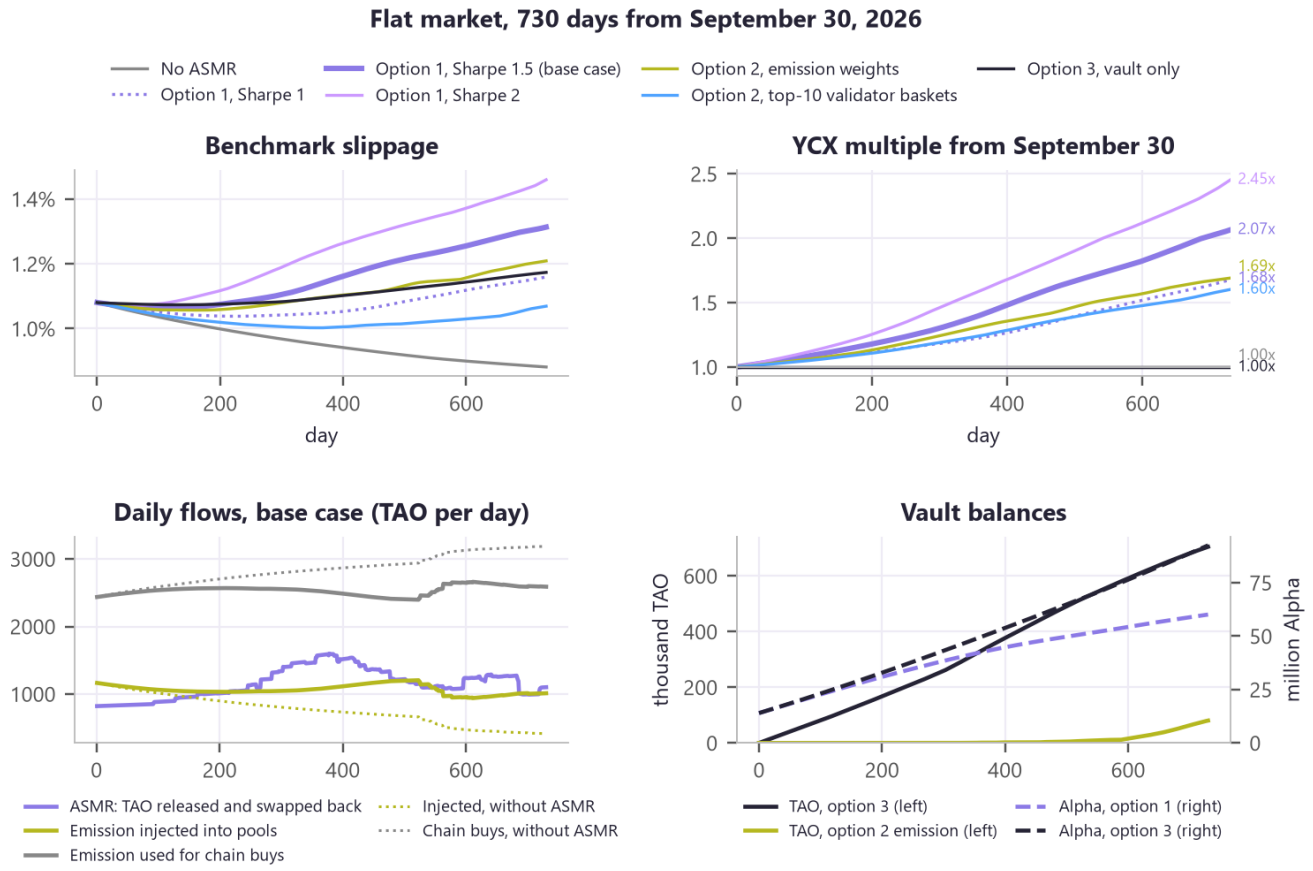


*Figure 2. Flat market, 730 days. Bottom left, base case: the chain's 3,600 TAO per day is either injected or used for chain buys, and ASMR shifts the split toward injection. Dotted lines are the same flows without ASMR.*

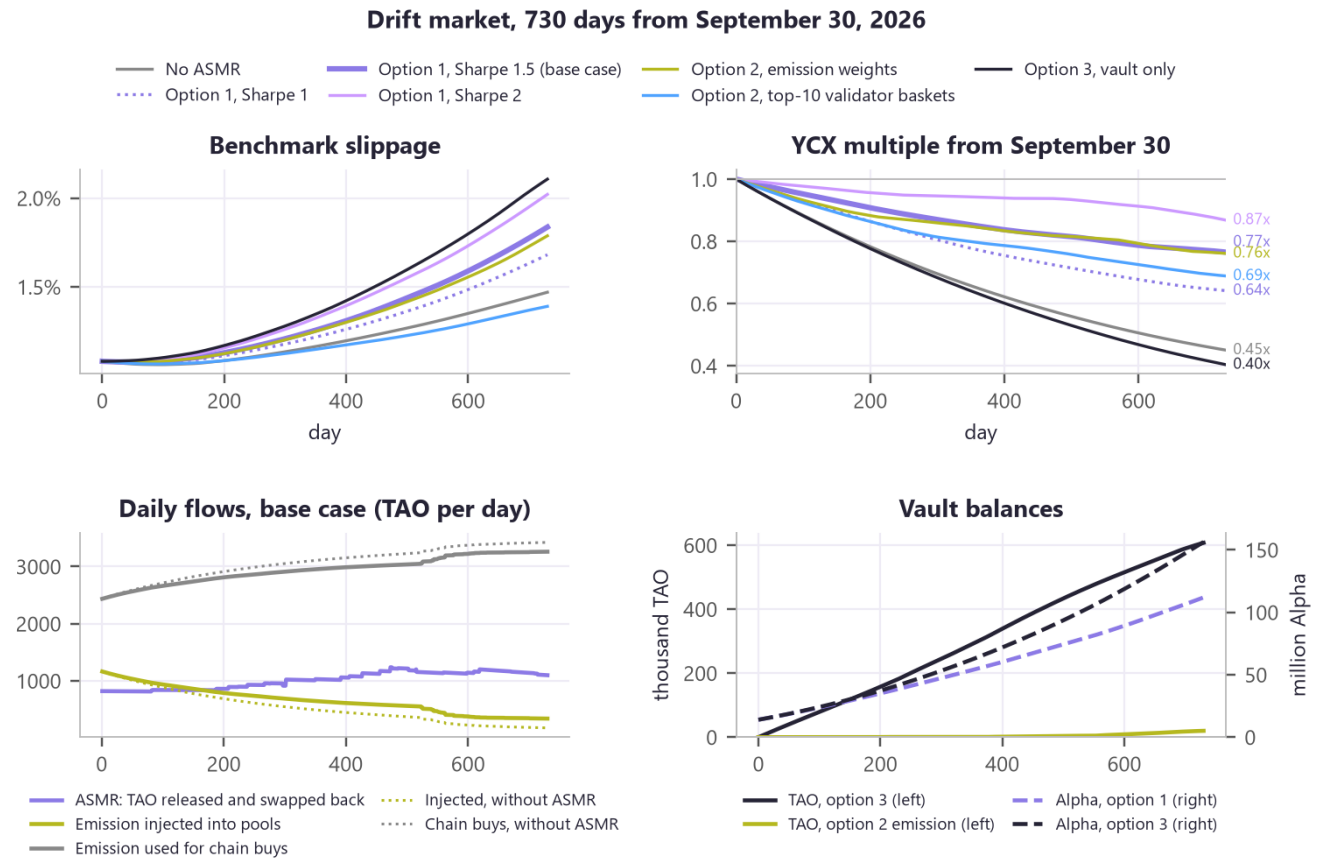


*Figure 3. Drift market, 730 days, with holders selling at the pace of the last six months. Without ASMR the index falls by 33% per year, the base case by 13% and vault-only by 36%.*

| # | Variant | Alpha burned | Alpha vaulted | TAO released | Paired | TAO only | Swap buys |
|---|---|---|---|---|---|---|---|
| 1 | Option 1, Sharpe 1 | 66.8M | 0.1M | 607K | 0K | 0K | 0K |
| **2** | **Option 1, Sharpe 1.5 (base case)** | **86.1M** | **0.5M** | **843K** | **0K** | **0K** | **0K** |
| 3 | Option 1, Sharpe 2 | 99.5M | 1.5M | 1,049K | 0K | 0K | 0K |
| 4 | Option 2, emission weights | 74.9M | 0.0M | 866K | 139K | 11K | 636K |
| 5 | Option 2, top-10 validator baskets | 81.4M | 0.1M | 806K | 164K | 73K | 541K |
| 6 | Option 3, vault only | 55.1M | 0.0M | 705K | 0K | 0K | 0K |

*Table 4. Accounting per variant, flat market, 730 days, options 2 and 3 at Sharpe 1.5. Burned Alpha is injected Alpha retired, and vaulted Alpha is mined Alpha retired beyond the guardrail. Paired, TAO only and swap buys are the three delivery channels of option 2. Option 3 holds its 705K released TAO in the vault.*

- **Flat market: the faster the pace, the tighter the pools (Figure 2).** Without ASMR the benchmark slips from 1.08% to 0.88%. At Sharpe 1.5 it reaches 1.31%, 49% higher, and at Sharpe 2 it reaches 1.46%, still under the 2% cap.
- **Drift market: returning the TAO as price offsets part of the selling (Figure 3).** The index loses 33% per year without ASMR. Option 1 limits the loss to 13% at Sharpe 1.5 and 7% at Sharpe 2. Option 2 by emission weights does as well, validator baskets lose 17%, and vault-only does worse than doing nothing, at 36%.
- **Why a flat market.** If no holder sold, chain buys alone would lift the index by 103% per year. We hold the market flat so that every price change in the results comes from ASMR.
- **Sensitivity to the measure.** Letting the flow averages scale with price gives 34% per year for the index, and with reserves 44%, against 44% in the base case. The geometric mean of the two sides gives 50%. Weighting the benchmark by TAO reserves gives 33%.

> KEY INSIGHT. **Removing liquidity from a pool without returning the TAO leaves Alpha holders worse off.** In the drift market, vault-only takes the YCX index down by 36% per year, against 33% without ASMR. A shallower pool absorbs the same selling with a larger price fall. Returning the released TAO as price support, as option 1 does, limits the fall to 13% per year on the same market.

# 4. LIQUIDITY ALLOCATION, OWNERSHIP, AND ECONOMIC TRADE-OFFS

ASMR frees TAO from over-liquid pools. Where should it go? Back into the same pool, across other subnets, or into a vault. Figure 4 shows what each choice does to prices, in a flat market and under selling.




*Figure 4. The three uses of the released TAO. Annual change of the YCX index and of the Total Subnets Price (TSP), the sum of subnet prices also called SoS, over the two-year runs of Section 3, at the base-case pace. Option 2 shows the range between emission weights and the top-10 validator baskets.*

**Why return the TAO to the same pool**

- **The value belongs to the Alpha holders.** The TAO emitted to a subnet was mined by its participants, who hold its Alpha. That value should come back to them, as liquidity or as price. Option 1 returns it to the holders who carried the excess depth.
- **Without action, holders still take the TAO out over time.** Holders receive Alpha emission and can progressively sell it for the TAO in the pool. The TAO in the pool belongs to current and future Alpha holders either way.
- **Depth and price stay in balance.** The same TAO buys either depth or price. Under option 1 the pool that gives up depth is the pool that gets the price, so the value stays within the subnet.
- **Subnets get room to break out.** Without ASMR and without selling, the pools keep getting deeper and a large buy moves prices less every year. Prices stay stuck, and so does the flywheel that turns a subnet's revenue into miner rewards and new capacity.

**Risks**

- **Price distortion and the emission it attracts.** A legitimate concern in the community is that option 1 pushes the prices of the large subnets too far, too fast. The pace answers it. In the base case Chutes rises 50% per year, its daily cap of 11.1 basis points compounded, and nothing else drives it. Today's chain buys already push harder: about Sharpe 1.6 on the YCX index and 3.9 on Chutes. The pace can be reset without touching anything else in the rule.
- **Emission concentration.** The top-10 share of TAO emission rises from 62% to 68% in the base case and stays at 62% without ASMR. The shift is small next to the price moves behind it, and it comes from the emission rule, which pays by price and which this paper does not propose to change.

- **TAO selling.** ASMR makes more of the pool TAO reachable, and holders who sell Alpha may go on to sell that TAO for dollars. The paper measures everything in TAO and does not model that pressure. The pace and the ADR guard spread it over time.
- **Deregistration under option 2.** Paired TAO goes to shallow pools, and small pools are the ones most often deregistered. TAO sent to a pool that is later dissolved leaves with it.

**Gaming**

- **The gaming that pays is making a pool look over-liquid.** Under option 1 a pool that reads over-liquid retires Alpha and its price rises, so a subnet could try to keep trading off its pool. Four features limit what that earns. The reading is a 90-day average. The gain is capped by the Sharpe pace. Each release makes the pool shallower, so the release stops by itself. One pool cannot move the network benchmark.
- **A control based on gross volume would limit it further.** A minimum of real trading before a pool qualifies, or a floor on depth tied to the gross volume it trades, cannot be escaped by netting flows, because a party's own trades count. Neither is simulated here.
- **Pushing a reading up earns nothing under option 1.** On Chutes it takes about 250 TAO per day of timed trades for three months, and all it achieves is to stop the pool from giving up depth.
- **Option 2 removes the incentive to look over-liquid and creates the opposite one**: a pool that avoids releasing still receives its share. The weights and the eligibility rule must be hard for a subnet to move, such as validator baskets. A usage-based signal such as gamma consumption, a service credit minted by burning a subnet's Alpha, is a further candidate, too recent to simulate.

**The vault: an existing balance and an opportunity**

The protocol already owns 14.0 million Alpha bought by chain buys since June 2026, which no mechanism spends today. Under option 3 ASMR adds the released TAO: after two years the vault holds about 705K TAO, 36% of today's pool reserves, and 92 million Alpha, almost all of it bought by chain buys.

- **An opportunity.** That capital could fund native protocol functions, such as liquidity lending, with the vault as a source of liquidity or collateral. Kept apart from the trading pool, it leaves the pool logic simple and easier to upgrade. One restriction: the vault should not sell its Alpha into the pools.
- **A cost for holders.** Option 3 returns nothing to Alpha holders. Under selling the index falls 36% per year, against 33% without ASMR.
- **A buyer of last resort would change that.** The vault could buy Alpha of its own subnet when the price falls well below its recent average, and never sell. That would return the value when holders need it most. It is not simulated here, and the governance of the vault is left open.

> KEY INSIGHT. **ASMR controls liquidity. Who receives what it releases is a political choice.** Returning the TAO to the pool it came from, at a set pace, is fair to the holders who carried the excess depth and keeps depth and price in balance for every subnet. A curated option 2 remains worth exploring. Vault-only returns nothing to holders, which costs them when the market sells.

## CONCLUSION

Part 1 showed that subnet pools hold more depth than their trading needs, that changing the curve does not size a pool, and that a one-off transition could retire the Alpha the protocol injected and lift the subnet index 2.3 times. This paper asked what happens when the rule runs continuously.

**ASMR has no end date.** Emission keeps deepening the pools it drains, so the question is how fast to run it. At Sharpe 1.5 the index rises 44% per year in a flat market. If holders keep selling as they did over the last six months, the index loses 33% per year without ASMR and 13% with it. The Sharpe cap keeps each daily move within a pool's normal volatility, which reduces the opportunities for arbitrageurs.

**Where the released TAO goes decides who gains.** Back in its own pool, it lifts the index 44% per year. Spread across subnets, it lifts the index 27% to 30% per year and gives shallow pools depth. Held in a vault, it returns nothing, and under selling the index falls 36% per year, worse than doing nothing. We put numbers on each option. The choice is the community's.

Key items to discuss with the Bittensor community:

- **The measure and its parameters.** The slippage proxy, the 2% ceiling, the 10% band, the Sharpe pace, its 50 bp cap and the ADR guard.
- **Risk controls.** Block-level averaging of flows, a fast stop on a short window, an aggregate volatility cap, and redistribution weights that recipients cannot move.
- **Who receives the released TAO.** Its own pool (option 1), other subnets (option 2) or a vault (option 3).
- **Settlement, as a separate question.** A pool only needs depth over the Alpha that can actually trade, so the same slippage could be delivered with fewer reserves.

**The same TAO can buy depth or price.** Emission is value the subnets have mined, and it reaches Alpha holders as depth, as lower volatility or as price. Today the network buys depth it does not use, and a paced rule can return the difference as price. Taking liquidity out without returning that value would leave Alpha holders worse off. For a subnet that earns revenue and buys back its Alpha, **that is the difference between a price that carries its growth and a price that mutes it**. This research does not forecast prices and does not propose a change to the emission rule.

**Next steps.** We invite the community to challenge this paper. A natural next step would be a granular block-level simulation and stress testing, with flows averaged over blocks as a live version would.

# APPENDIX

## A. Chain rules used

The simulation follows the chain rules in force on September 30, 2026, as read on the subtensor main branch on November 10, 2026. Later rule changes are not modeled.

**Emission.** Subnets receive TAO emission in proportion to their moving-average prices, passed through a gate that favors larger shares: a Hill function with exponent 3 whose threshold is the 32nd-largest share. Miner burn, which also scales emission, is not modeled.

**Issuance.** The network emits 3,600 TAO per day since the December 2025 halving. Each subnet mints Alpha on the same halving schedule, applied to its own issuance: 7,200 Alpha per day until it has issued 10.5 million, half that until 15.75 million, and so on. Burned Alpha stays in that count. Every pool starts at 7,200 Alpha per day, and in the runs 67 subnets pass 10.5 million within the two years, with or without ASMR.

**Injection and chain buys.** Since June 22, 2026 the Alpha injected into a pool is the lower of its TAO emission at the pool price and the root proportion of its Alpha emission, and the matching TAO is injected with it. The TAO that cannot be paired buys Alpha from the pool, and that Alpha is credited to a per-subnet protocol balance. Emission shares returned to prices on the same day. Before that, from November 2025, emission shares followed net flows. The root proportion falls as a subnet ages, which moves its TAO emission from injection to chain buys. The injected share of emission went from 62% in May 2026 to 31% in September.

**Protocol Alpha.** The Alpha bought by chain buys is held in a per-subnet balance since June 2026, and nothing spends it today. It totals 14.0 million Alpha on September 30, 2026.

**Root Reborn.** Live since August 3, 2026. Root stakers' Alpha dividends are no longer sold each block. They are staked on the origin subnet in a per-validator basket, which validators rebalance through on-chain swaps under concentration, liquidity and turnover caps. Baskets do not direct emission.

**Pool invariant.** The swap pallet prices each pool with a weighted invariant. On September 30, 2026 the price of every pool matches its reserve ratio to within 1%, the constant-product case the paper uses throughout.

**Swap fee.** 0.05% per swap by default, set per subnet by root. It is the rate Part 1, Section 3.2 uses.

## B. Engine specification and checks

**State.** Reserves, outside Alpha and its staked part, Alpha issuance, root proportion, flow averages F per side, cumulative Alpha injected since registration (the guardrail), 90-day volatility, observed 30-day emission share, prior-day market cap and protocol Alpha, per subnet, on September 30, 2026. The staked count may include the 14.0 million Alpha the protocol owns, which the runs use as the vault seed.

**Daily order.** Each simulated day runs seven steps.

- **Emission.** Shares $s_i$ come from prices. Each subnet receives TAO $e_i = 3{,}600 s_i$, mints $m_i$ Alpha to holders, and injects Alpha $a_i = \min(e_i/p_i, r_i m_i)$ with the matching TAO. The excess TAO buys Alpha from the pool at constant product and the Alpha goes to the vault.
- **Market.** Flat: holders sell Alpha until the price is back at its pre-emission level, capped at 5% of their holdings per day. Drift: the same plus 3.67 basis points of staked Alpha sold per day.
- **Measure.** The slippage proxy of each pool, the benchmark, the target, the lower of the benchmark and 2%, and the band around it.
- **Modes.** A reading below the band sets a pool over-liquid, above sets it under-liquid, and inside keeps its mode. The ADR guard pauses the next two steps on a pool whose ADR exceeds 2 times the network median, until it is back below 1.5 times.
- **Retirement.** Over-liquid pools remove a fraction $x_i = \min\left(1 - S_i/S_{\text{top}}, \pi_i\right)$ of both reserves. Alpha is burned up to the guardrail, which grows with each day's injected Alpha, and vaulted beyond it. The TAO goes to the vault. Under option 1 the released TAO is swapped straight back, which equals removing Alpha until the band top on the Alpha side, paced by the price cap.
- **Reallocation under option 2.** Weights come from emission shares or baskets. Under-liquid pools receive paired TAO and vault Alpha up to the band bottom and the pace, TAO alone only when the TAO side binds. Over-liquid and inside-band pools receive swap buys up to the band top and the pace.

- **Index.** The weighted sum of price returns on prior-day weights.

Here $S_{\text{top}}$ is the top of the band and $\pi_i$ the pace fraction. In the one-off transition of Part 1, Section 3.3 the removal also stops at the guardrail.

**Issuance.** Each subnet's issuance $I_i$, the Alpha in its pool and outstanding, sets its daily Alpha emission and its root proportion:

$$m_i = \frac{7{,}200}{2^{k_i}}, \quad k_i = \left\lfloor \log_2\left(\frac{1}{1 - I_i/21\text{M}}\right)\right\rfloor \qquad \text{and} \qquad r_i = \frac{x}{x + I_i}$$

Emission and injection add to $I_i$. Chain buys, vaulting and burning leave it unchanged: bought and vaulted Alpha stays outstanding, and burned Alpha stays in the count, as with the chain's burn. The root term x, root stake times the network's TAO weight, is calibrated per subnet from the September 30 root proportion and held fixed. The calibrated values average 0.99 million Alpha with a dispersion of 0.2% across subnets, as a single network value implies. The chain also counts a protocol reserve of the swap pallet in issuance. The panel does not report it, and the fit suggests it is negligible.

**Pacing.** The daily cap on the log price change scales with each pool's annualized volatility, up to a flat ceiling of 50 basis points, and a price-neutral removal turns it into a cap on the reserve fraction:

$$\delta_i = \min\left(\frac{\text{Sharpe} \cdot \sigma_i}{365}, \quad \ln(1.005)\right) \qquad \text{and} \qquad \pi_i = 1 - \exp\left(-\frac{\delta_i}{2}\right)$$

Part 1, Section 3.3 uses the flat cap $\ln(1.005)$ alone. For Chutes σ = 26.9%, so Sharpe 1 is 7.4 basis points per day, and 730 days at that cap compound to $\exp(2\sigma)$ = 1.71x, which is what the run returns.

**Shares from prices.** Price shares pass through the Hill gate, with θ the 75th percentile of positive shares and h = 3:

$$g(w) = \frac{w^h}{w^h + \theta^h}$$

The gated shares then multiply per-subnet factors fixed at day 0 so that day-0 shares equal the observed 30-day shares. The factors are bounded at 4 so near-zero shares cannot be amplified without limit, and 6 subnets sit at that bound. Day-0 misallocation is 0.2%.

**Drift calibration.** The YCX index drifted by −12.7 basis points per day over the last 180 days. Uniform selling of a share s of staked Alpha A into a constant-product pool with Alpha reserve α moves its price by about

$$\frac{\Delta p}{p} \approx -\frac{2sA}{\alpha}$$

The share s is set so that the index-weighted average of that move equals the realized drift, which gives 3.67 basis points per day.

**Conservation.** Every run checks that TAO in the pools plus the TAO vault plus TAO paid to sellers equals starting TAO plus cumulative emission, and that Alpha in the pools plus outside Alpha plus the Alpha vault plus burned Alpha equals starting Alpha plus the vault seed plus cumulative Alpha emission. Residuals are below $10^{-8}$ TAO and $10^{-5}$ Alpha in every run, and each subnet's tracked issuance matches its reserves plus its burned Alpha to within $10^{-6}$ Alpha.

**Simulation on the curve.** Rows 7 and 8 of Table 2 keep the migrated pools on their curves. A pool is then described by its exponent R and its price. Swaps, chain buys and holder selling move the price at a fixed R. Injection is price-neutral, as on chain: R rises at a fixed price until the TAO is absorbed or the injected Alpha reaches the root-proportion cap. Under option 1, retirement and swap-back lower R at a fixed TAO reserve. The metric uses local depth (Part 1, Appendix B) in place of the reserves. 32 of the 47 over-liquid pools have a point on the curve, the others are shrunk in proportion, and with no migration the simulation reproduces the constant-product runs exactly.

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