

TAXMAN

A fund that taxes the bots that balance it

TAXMAN holds a fixed mix of assets in one on-chain pool. When prices pull the mix off its targets, arbitrage bots trade it back for their own profit, and every one of those trades pays the pool a fee that the holders keep. The job a fund manager is paid for is done by the market, and the fund earns the fee instead of charging it.

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1 Summary

A fund with fixed target weights, such as 35% of one asset and 10% of another, drifts away from its targets every time prices move. Bringing it back costs trading fees and a manager's time, and the holder pays for both. TAXMAN removes the manager. Each fund is a weighted pool that is a fund and a market at once. Anyone can trade against it, but the program accepts a trade only if the pool ends richer by a fee. When the mix drifts far enough, putting it back becomes profitable for arbitrage bots even after paying that fee, so they do the rebalancing and pay the holders for the chance to do it.

The pool design and its fee come from *Mandate without Managers: Automated Market Makers as Verifiable Portfolio Products* by Feinstein, Florescu and O'Leary (arXiv:2608.02917, August 2026). TAXMAN is a Solana program built on that design, with three additions of its own: a covenant the author can never break, a royalty the author earns only for results, and target weights that can glide slowly from one mix to another.

On 168 days of real prices, a $100,000 CORE fund rebalanced only by arbitrage finished at $97,138 while the same money left alone finished at $96,683. Over those days bots traded it back into line 67 times, $10,740 in all, and paid the fee on every trade.

2 The fund is the market

A TAXMAN pool holds between two and eight assets at published target weights `w_i` that sum to one. One share of the pool is a fixed fraction of every reserve it holds. Deposits and withdrawals are always in proportion to the reserves, so they never trade against the pool and never pay the fee.

The invariant

The pool keeps the weighted geometric mean of its reserves `x_i` from falling:

```
prod x_i ^ w_i   never decreases
```

Without a fee, an arbitrageur facing outside prices would move the pool exactly onto its targets, so that the value held in each asset equals its weight times the pool's value (Lemma 1 of the paper). That is a perfectly rebalanced fund, but every bit of the rebalancing profit goes to the arbitrageur.

The fee

A trade changes each reserve by a ratio `r_i = x_i' / x_i`. The program accepts it only if

```
ln g = g_fee * min_i ln r_i  +  (1 - g_fee) * sum_i w_i ln r_i   >   0
```

The program also keeps a tiny safety margin above zero. The second term is the growth of the fee-free invariant. The first charges the trade on its worst leg. This is the multi-asset fee of the paper (Definition 3). Proportional deposits and withdrawals have every `r_i` equal, so they pay nothing, and splitting a trade into pieces never makes it cheaper (Lemma 4).

The band

Because every trade pays the fee, arbitrage stops before the target. After optimal arbitrage each weight sits inside a band around its line (Corollary 6):

```
(1 − g_fee) * w_i   <=   weight_i   <=   g_fee + (1 − g_fee) * w_i
```

Inside the band any trade would lose money to the fee, so nobody trades and the pool sits still. Outside it, a bot can profit by trading the weight back to the band's edge, and pays the pool on the way.

Worked example. A $100,000 CORE pool at target, with BTC (target 15%) priced up 24.4%, which pushes BTC to 18.0% of the pool. With a 3% fee the band for BTC runs from 14.55% to 17.55%.

	Fee 0	Fee 3%
BTC weight after arbitrage	15.00%	17.55%
Arbitrage profit	$330.55	$7.16
Pool value after	$103,327.98	$103,651.38

The 3% fee keeps $323.40 in the pool that a fee-free pool would have handed to the arbitrageur. Computed with the closed-form optimal arbitrage of the research spike (`spike/g1_g3m.py`).

3 What TAXMAN adds

The covenant

When an author publishes a fund, they write limits into it that no instruction can change afterwards: a cap on each asset's weight, a floor on the cash leg, bounds on the fee and the author's royalty rate. CORE never holds more than 40% SPYx, 15% NVDAx, 10% TSLAx or 20% BTC, and always keeps at least 30% USDC. The author can revise the target inside those limits, but a target moves at most 2 points a day, and the fee moves at most 0.25 points per revision and at most once a day. A request outside the covenant is refused with `CovenantViolation`.

A royalty paid only for results

The author earns a share of fee growth only on trades made while the pool stands at its high-water mark. The pool prices its own share without an oracle, as the quote reserve over its weight per share, smoothed over one day so that nothing done inside a single transaction can move it. In the 168-day replay the gate was open for 4 of the 67 trades.

Glide

A fund can move its target linearly from one mix to another over a set period, for example from a growth mix toward a cash-heavy one. Reserves do not change when the target moves, so holder value is continuous, and arbitrage walks the pool to the new weights inside the fee band.

Leaving when an asset is frozen

If an issuer pauses a mint or freezes the pool's vault for one asset, a normal withdrawal would fail for everyone. `withdraw_deferring` lets a holder leave anyway with everything else; their share of the frozen asset stays in the vault as a claim in their name, collected with `claim_deferred` once the asset can move again. Leavers and stayers never carry each other's risk in that asset.

4 Evidence on real prices

The replay uses real hourly prices for SPYx, NVDAx and TSLAx from their Solana pools, Coinbase hourly BTC, and USDC fixed at one dollar: 3,622 aligned hours over 168 days, May 25 to November 8, 2026. It was a falling market, in which buy-and-hold of the CORE mix lost 8.03% a year annualized. The only flow is optimal arbitrage, the paper's adversarial setting.

Fee	Holder, a year	Ahead of buy-and-hold
0%	-8.47%	-44 bps
0.5%	-6.61%	+142 bps
1%	-6.32%	+171 bps
2%	-6.20%	+183 bps
2.73%	-6.26%	+177 bps
3.9%	-6.49%	+154 bps
5%	-6.60%	+143 bps
7%	-6.79%	+124 bps
10%	-7.24%	+79 bps

Hourly arbitrage on the CORE fund. At a fee of 0 the holder loses to buy-and-hold, which is the point: the fee is the mechanism.

Against an ideal fund rebalanced continuously for free, the machine costs 28 to 74 basis points a year across 4-hour, 12-hour and daily arbitrage in the paper's fee window of 2.73% to 3.90%, which is the cost class of an index fund's expense ratio with no manager at all. Monthly tracking error in that window is 25 to 51 basis points a year.

The program itself was replayed against the reference model on the same hours, with the protocol's share and the author's royalty switched on:

	CORE, fee 3%	GROWTH, fee 2.5%
Arbitrage trades, program and reference	230 and 230	416 and 416
Worst hourly gap in value per share	0.0000021	0.0000043
Holder a year, after protocol share and royalty	-6.53%	-13.74%
Buy-and-hold of the same mix	-8.03%	-15.77%
Holder ahead of buy-and-hold	+150 bps a year	+203 bps a year
What protocol share and royalty cost holders	22 bps a year	30 bps a year

Limits of the evidence

- 168 days and one market regime, a falling one.
- Arbitrage-only flow is a conservative bound; a live pool also trades with other users.
- At a 3% fee the pool quotes wide. It is a fund that markets keep on target, not a venue for everyday swaps.
- Pool prices for tokenized stocks carry print noise; against an hourly benchmark the cost reads about 350 bps a year, an artifact of that benchmark trading the noise for free.

5 The program

One Anchor program owns every pool. Nothing off chain is needed for a pool to work: there is no oracle, no keeper with special rights, and no admin key over pool funds. The config authority can point the protocol's share at a treasury account and has no power over any pool's reserves, covenant, weights or fee.

Property	How it holds
No trade can take value from holders	`verify_update` rejects any update whose fee-adjusted invariant does not grow
A donation to a vault changes nothing	the invariant runs on reserves recorded in the pool, never on vault balances
The share supply can never be drained to zero	1,000 base units of shares are locked at seed forever
Exact arithmetic at the boundary	the program's logarithm is within 3e-18 of a 60-digit reference; 600 of 600 optimal arbitrages are accepted and 600 of 600 versions one basis point greedier are rejected
Fits a Solana transaction	a five-asset rebalancing trade uses about 119,000 compute units; an eight-asset trade with every leg moving uses 186,400, in a 1,210-byte transaction
Cheap to open	rent for a five-asset pool is about 0.0145 SOL

A pool refuses mints with transfer fees, non-transferable or confidential mints, mints whose accounts start frozen, and mints with a transfer hook program set. It accepts, with disclosure, mints that can be paused, that carry a permanent delegate or a freeze authority, or that use a scaled display amount.

6 Economics

Flow	Rule
Arbitrage trader to holders	every accepted trade grows the invariant by at least the fee, and that growth belongs to every share
Holders to protocol	10% of each trade's fee growth, paid as newly owed shares
Holders to author	the covenant's royalty rate of fee growth (at most 20%), only on trades made while the smoothed index is at or above its high-water mark
Deposits and withdrawals	proportional, so they pay nothing

Launch funds

Fund	SPYx	NVDAx	TSLAx	BTC	USDC	Fee
CORE	35%	10%	5%	15%	35%	3%
GROWTH	25%	20%	15%	25%	15%	2.5%

Both launch funds carry an author royalty of 10% of fee growth, merit-gated, and fee bounds of 1% to 5% in their covenants. Anyone can publish another fund; publishing creates the pool account the moment the transaction lands.

7 Risks and disclosures

- **Market risk.** TAXMAN changes who pays for rebalancing; it does not remove the risk of the assets. In the replay both the fund and the same money left alone lost value, and the fund lost less.
- **Issuer powers over tokenized stocks.** SPYx, NVDAx and TSLAx are Token-2022 mints. Their issuer can pause the mint, holds a permanent delegate that can move tokens out of any account including a pool vault, and holds a transfer hook authority with no hook set today. A future hook would make the mint unusable in a new pool and is a risk for an existing one.
- **Issuer powers over BTC.** The BTC leg is cbBTC, whose issuer holds a freeze authority. `withdraw_deferring` is the exit if any one asset cannot move.
- **Scaled amounts.** The tokenized stocks express total return through a scaled display amount. The pool works in raw units, and arbitrage absorbs the change in price per raw unit.
- **Wide quotes by design.** The fee that pays holders also means the pool is an expensive place for a small everyday swap.

8 References

- Z. Feinstein, I. Florescu, S. O'Leary. *Mandate without Managers: Automated Market Makers as Verifiable Portfolio Products.* arXiv:2608.02917, August 2026.
- TAXMAN documentation: taxman.run/docs, including the replay method, the error reference and the full security notes.

This paper describes software and measurements. It is not investment advice, and past results on historical prices do not predict future returns.