

Indexed We Trust

Automated Index
Portfolio Management



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What Is An Index?

Any instrument that **tracks the performance** of a selection of underlyings.

TradFi examples: S&P500, Nasdaq Composite, DJIA

Each component has a **weight**, determined by a fixed **strategy**, e.g.

- **Price-weighted**
- **Capitalisation-weighted**
- **Equal-weighted**

A crypto index is - fundamentally - no different.



Why Bother With An Index?



[yes, I'm aware I'm misusing the template]

Liquidity Pools Are Indices!

A **Uniswap V2** liquidity pool for - e.g. NDX/ETH - is an index of sorts!

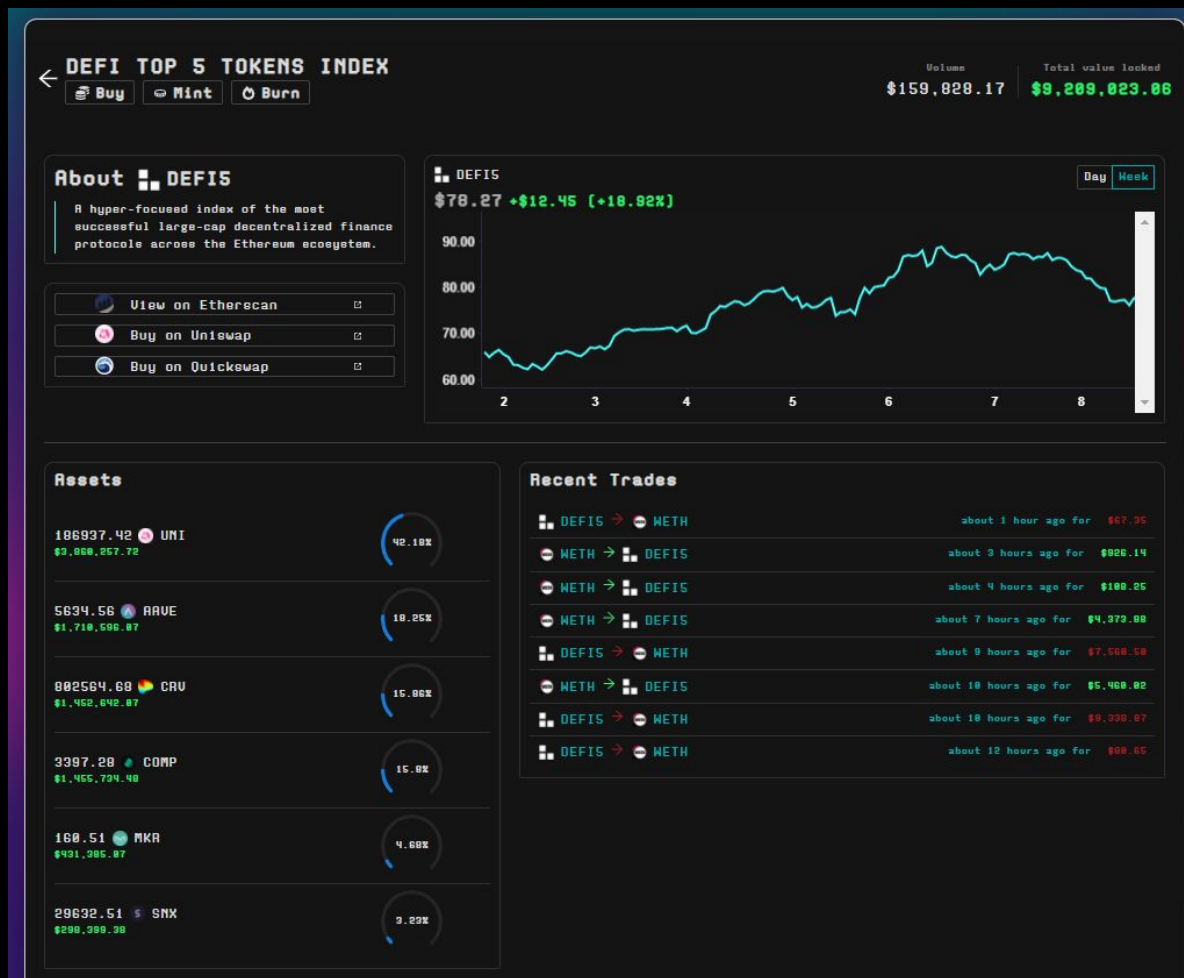
- Initialised with 50% in NDX and 50% in ETH
(a fixed allocation isn't really an index, but you can track price)
- **LP tokens** are 'shares' in that index

Balancer liquidity pools are closer to real indices:

- Can hold **several assets** in a single pool
 - e.g. UNI / AAVE / CRV / COMP / MKR
- Smart pools can **adjust their weights**



Example:



Problem: Weight Determination

If you want a pool to represent a **real index**, you need a strategy for

- **determining the weights** of each component, and
- how often you **rebalance those weights**.

Leaving that power to a person/group of people isn't ideal.

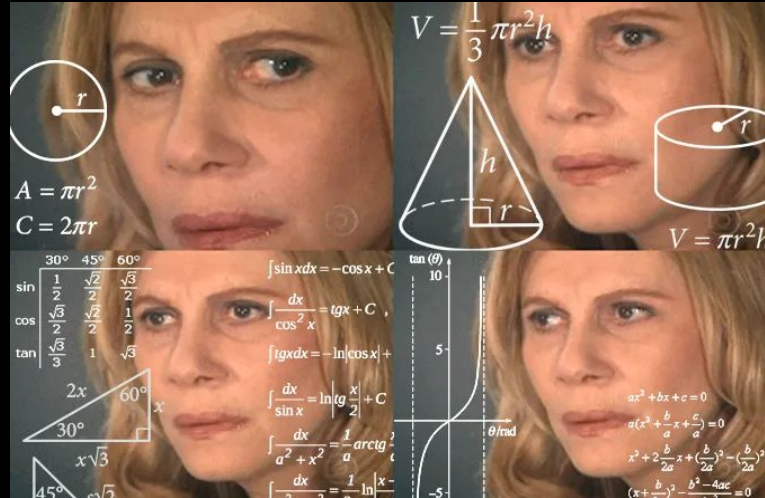
Historically, **passive management** has produced **better returns** than decisions made in the fires of a volatile market.

(Hi if you're watching, Buffett!)



Side Issue: Human Intermediaries

Even if they act honestly, if you have someone doing this...



...you're probably going to have to **pay them** for their effort.

See: '**management fees**', which eat into your profit.



Solution: Scoring Strategies

A scoring strategy is a smart contract that **determines asset weights** using on-chain data **without human intervention**.

Example: square root of fully diluted valuation (SRFDV).

- Query total supply, Uniswap V2 **TWAP oracle** for each asset
- Square root FDVs, calculate sum total
- Assign asset weights based on **proportion** of squashed total



Example: SRFDV Weighting [DEFI5]



	Token	Price	Max Supply	FDV	Sqrt FDV	Weight
	UNI	17.24	1,000,000,000	17,240,000,000	131,301	34.32%
	AAVE	271.73	16,000,000	4,347,680,000	65,937	17.23%
	CRV	1.51	3,303,030,299	4,987,575,751	70,622	18.45%
	COMP	405.48	10,000,000	4,054,800,000	63,677	16.64%
	MKR	2,595.76	1,005,577	2,610,236,553	51,090	13.36%
		[15 July]		33,240,292,304	382,627	

Who Can Perform A Reweighting?

Anyone can:

- **Update** the TWAP oracle for the assets within an index
- **Submit** a request for an index reweighting
 - Accepted after **seven days** since the last reweighting

There's a gas cost to this, obviously, currently borne by the Core team.

These operations aren't restricted to EOAs, so they can be **automated via keepers** and have gas costs refunded (plus some extra as a thanks).



Problem: Asset Universes & Active Selections

Indexed pools have a maximum of 10 weighted assets at any given time, to reduce impermanent loss incurred by swaps.

An index tracking a market sector very likely has more 'candidate' tokens focused on that space than there are available weight slots.

See DeFi - you can get diversified exposure with 5 or 10 tokens, but there are quite literally hundreds, if not thousands of DeFi tokens.

So how do you decide which tokens are the best representatives?



Solution: Periodic Reindexing

We allow 'candidate lists' of **up to 25 assets** that are *eligible* to enter the index **depending on the score** given by the associated strategy.

After every three reweighs, we perform a **reindex** - a reweigh++.







This involves querying the scoring strategy for *all* assets in the candidate list (not just those currently in the index), and **ranking them** accordingly.



If a token falls out of the top N score-wise, it is assigned **zero weight**, and a **new token** is assigned a weight in its place.



Example: ORCL5 Reindexing

Index tracking oracle market sector. **Five** weighted assets at once.

	Token	% 15/06 [Target]	% 29/06 [Target]	% 15/07 [Actual]
	LINK	59.32	60.82	59.26
	UMA	13.39	13.31	13.1
	ORAI	10.29	8.59	9.78
	BAND	10.17	10.23	10.38
	DIA	6.8	-	6.29
	API3	-	7.03	1.18



Problem: Weight Shifts & Price Impact

Changing the weights of an index pool instantly **alters the spot price**.
[Courtesy of Invariant V]

You can get around this price shift by **adding/removing asset liquidity** at the same time that you change the weights.

Assumes that the account changing the weights has access to enough of the underlying assets to do so.

Indexed Finance pools are **public to all**, so we can't rely on this.

So how do pools **rebalance** upon reweighting or reindexing?



Solution: Spot-Induced Weight Shifts

Indexed pools have a **post-swap hook** for slowly adjusting weights.

If a token is swapped in to the pool, and the actual weight is less than the target weight, increase the actual weight by **1% of current value**.

Similarly, decrease actual weight if necessary on swaps out of the pool.

Hook fires every **30 minutes per asset**: you cannot quickly drag weights up or down through several swaps (to minimise IL).

Indexed pools are included in the **1inch router** for exposure.



Example: DEFI5 Swap

Swap x MKR for y UNI in DEFI5 pool, both need weight shifts:

	Token	Pre-Swap Weight Score	Pre-Swap Weight %	Target Weight %	Post-Swap Weight Score	Post-Swap Weight %
	UNI	1000	40%	35%	990	39.74%
	AAVE	500	20%	18%	500	20.07%
	COMP	500	20%	21%	500	20.07%
	CRV	375	15%	16%	375	15.05%
	MKR	125	5%	10%	126.25	5.07%
		2500			2491.25	

Problem: Administering Everything

Who decides what tokens go into the **candidates** list for an index?

How do you keep track of token **addresses** to update oracles?

What do you need to do to trigger **reweighs**?

Where can I see what **scoring** strategy is tied to which index?

How do I see the **target** weight for a particular asset?

And on, and on...



Solution: Controller Contracts

‘Administrator’ contracts that handle **several pools** at once.

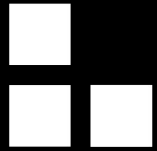
Owned by the **Indexed Finance DAO**, which has the power to add or remove tokens from candidate lists via **Governor Alpha** votes.

Arbitrary accounts can perform updates, reweighs and reindexes for distinct pools from a **single location**.

Controllers are upgradable proxy contracts: **adjustable parameters** such as maximum weight, swap fees etc., again through the DAO.



indexed.finance



DEFI5



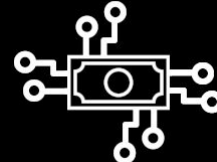
DEGEN



CC10



ORCL5



FFF



NFTP



Twitter: [@ndxfi](https://twitter.com/ndxfi)



Medium: ndxfi.medium.com



Reddit: [/r/IndexedFinance](https://r/IndexedFinance)

Decentralized Index Protocol

Gain exposure to passively-managed crypto index portfolios represented by a single token.

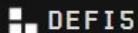
TOTAL PROTOCOL ASSETS UNDER MANAGEMENT

\$22,168,025.68

DIVE IN TODAY

BUY AN INDEX

LEARN MORE



DEFIS

\$88.61

A hyper-focused index of the most successful large-cap decentralized finance protocols across the Ethereum ecosystem.

Total Value Locked

\$8,029,832

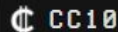
α DEGEN

\$2.85

A higher risk/reward index of promising Ethereum protocols that are judged as having significant room to grow.

Total Value Locked

\$7,617,761



CC10

\$48.87

An index covering the most popular medium/large-cap Ethereum protocols, primarily drawn from decentralized finance.

Total Value Locked

\$3,829,825



FFF

\$71.39

A new-to-crypto-investing option, providing 28% exposure to both BTC and ETH, as well as large-mid cap DeFi protocols.

Total Value Locked

\$1,564,488



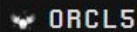
NFTP

\$18.24

A collectors index of governance and protocol tokens drawn from both the NFT space and the wider Metaverse.

Total Value Locked

\$909,938



ORCL5

\$8.98

An index representing the current market leaders in protocols designed to bring external/real-world data onto the blockchain.

Total Value Locked

\$216,178

BUT WAIT

THERE'S MORE



Yield-Bearing Indices

Most of the tokens included in these pools can be **loaned** out via, e.g. Compound or Aave in exchange for interest-bearing tokens.

Using these, you can produce an **interest-bearing index**.

However, the **rates** of these interest-bearing tokens are often dependent on the relative amount of **capital deposited** to that platform.

It would be nice if an interest-bearing index contained tokens that split its underlying across **several protocols** at once to **maximise yield**...





Introducing Nirn

Nirn is a **wholly-automated permissionless yield aggregator**, operating across approved protocols via a common interface.

Funds in Nirn vaults can be **segmented** across any whitelisted protocols that have active lending markets for the underlying asset.

- e.g. DAI vault = 50% Compound, 30% Aave, 20% CREAM

Arbitrary EOAs can propose new weightings for a vault, which will only execute if the weighting is validated as producing a **higher yield**.

Optimal allocations are a fairly simple variant of the knapsack problem.

Intent: use Nirn vault tokens as **proxy assets** within Indexed pools.



The More You Know

Supports Aave, Compound, CREAM, Iron Bank, dYdX and Fulcrum.

Vaults for 100 assets across 175 wrappers, out of the box.

Can be used as a standalone yield generator, separate to index pools.

Average APYs for existing pools vary between 0.46% - 2.12%.

Go and read the [whitepaper](https://tinyurl.com/nirn-paper): <https://tinyurl.com/nirn-paper>

That's the actual end of the talk this time, I promise.

