

A CHAINLINK PRODUCT RESEARCH REPORT

The Need for a Chainlink DeFi Yield Index



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Introduction

The traditional banking system has long been a cornerstone of global finance, promoting capital efficiency by being a nexus point between savers and borrowers. By contrast, decentralized finance (“DeFi”) lending enables users to borrow from and lend to each other without the need for intermediaries, where users earn interest on their assets by supplying them to lending pools, and borrowers can access various digital financial assets. Chainlink Price Feeds play a critical role in DeFi as lending protocols rely on accurate prices to value collateral, liquidate loans, calculate interest rates, and manage risk.

One of the key differences between traditional and decentralized finance is how the returns on assets are determined. In traditional banking, yields are distributed by centralized financial institutions like banks or governments, whereas in DeFi they are largely determined algorithmically. However, it is difficult to directly compare yields between banking and DeFi due to DeFi’s diverse yield ecosystem. As such, users would benefit from an index that tracks and aggregates lending yields across DeFi. Chainlink is substantially qualified to construct such an index because our platform is deeply embedded in DeFi and our decentralized data aggregation methodologies have proven to be accurate and robust.

In the sections that follow, we provide 1) a background into DeFi lending markets, 2) an overview of recent trends and innovations in DeFi, and finally 3) a demonstration of a robust new DeFi yield index called the **Chainlink DeFi Yield Index**.

A Quick Primer on Decentralized Finance (“DeFi”)

To help contextualize the Chainlink DeFi Yield Index, we provide a broad introduction to decentralized finance. The term traditional finance (“TradFi”) describes the prevailing finance industry that encompasses services like commercial banking, brokerage, trust/custody, investment management, insurance, and so on. Since these services are typically offered and controlled by single entities, such as companies, they are considered centralized finance (“CeFi”) (community lending might not fit this definition). In contrast, blockchain technology has led to the development of decentralized finance (“DeFi”), which offers financial services through automated software (smart contracts) running on a decentralized network (blockchain) without an intermediary (such as a company). These services are enabled by a collection of smart contracts and governance procedures called “DeFi protocols,” such as lending protocols and decentralized exchanges (“DEXs”). Aave and Compound are two of the largest DeFi lending protocols, while Uniswap, Curve, and Balancer are among the largest DEXs.

Some key features of DeFi include:

1. **Open and permissionless:** DeFi is theoretically open to anyone with an internet connection, eliminating the need for intermediaries and gatekeepers, and allowing anyone to participate in the ecosystem.
2. **Transparency:** All transactions and smart contracts in DeFi are recorded on a blockchain, creating a transparent and auditable financial system.
3. **Interoperability:** DeFi protocols are often interoperable and composable, allowing users to access a variety of financial services from different platforms and applications.
4. **Decentralized ownership:** Users maintain control of their assets and private keys, reducing the risk of funds being frozen, confiscated, or misused by poorly run intermediaries.

CeFi has undeniably been the predominant form of financial infrastructure and contributed to much of human progress up to this point. Banks and exchanges have supported economic growth by efficiently allocating capital from savers to fund businesses, individuals, and long-term, large-scale projects. Centralized regulatory authorities have helped ensure stability by making unilateral decisions in response to crises. Yet CeFi’s limitations have continually manifested over hundreds of years through sudden dramatic financial crises and persistent economic inequality. Many of these outcomes have been driven by a lack of access, a lack of transparency, or mismanagement (and sometimes outright fraud) by centralized entities. To be clear, some financial services in the crypto space are offered by companies and thus considered centralized. While the fall of FTX, a centralized crypto exchange, has stained the broader crypto space in the public eye, it has also bolstered the argument for DeFi.

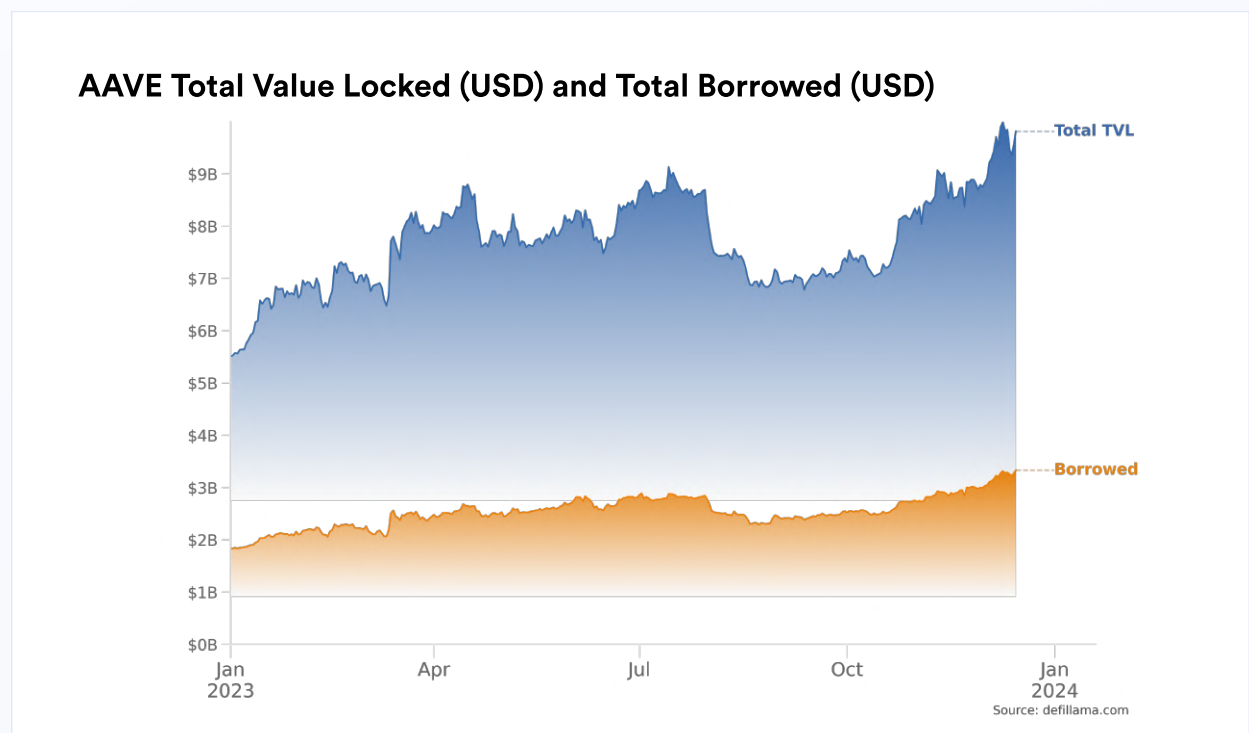
Lending in Decentralized Finance

DeFi lending allows individuals to lend and borrow digital assets without the need for traditional financial intermediaries like banks. A user deposits (or “supplies”) a token as collateral on a lending protocol, and then can borrow up to a predetermined amount of another token. The parameters of the lending protocol are set in open-source smart contracts, ensuring transparency and accessibility. These parameters include the types of tokens that can be supplied as collateral or borrowed as a loan, the amount that can be borrowed for a given collateral token, and the interest rates for both supplied and borrowed tokens. In the context of lending protocols, “total value locked” (TVL) refers to the total amount of assets deposited that generates economic activity. As of January 9, 2024, the TVL on DeFi lending protocols across all chains is roughly \$23B.

Project	TVL (USD)	Category
JustLend	\$6,697,695,928	Lending
AAVE V3	\$3,968,254,220	Lending
AAVE V2	\$2,496,549,250	Lending
Spark	\$1,503,542,004	Lending
Compound V3	\$1,210,523,181	Lending
Compound	\$1,180,311,733	Lending
Venus Core Pool	\$774,179,057	Lending
Morpho Aave	\$358,179,623	Lending
Radiant V2	\$330,631,830	Lending
Benqi Lending	\$271,080,962	Lending

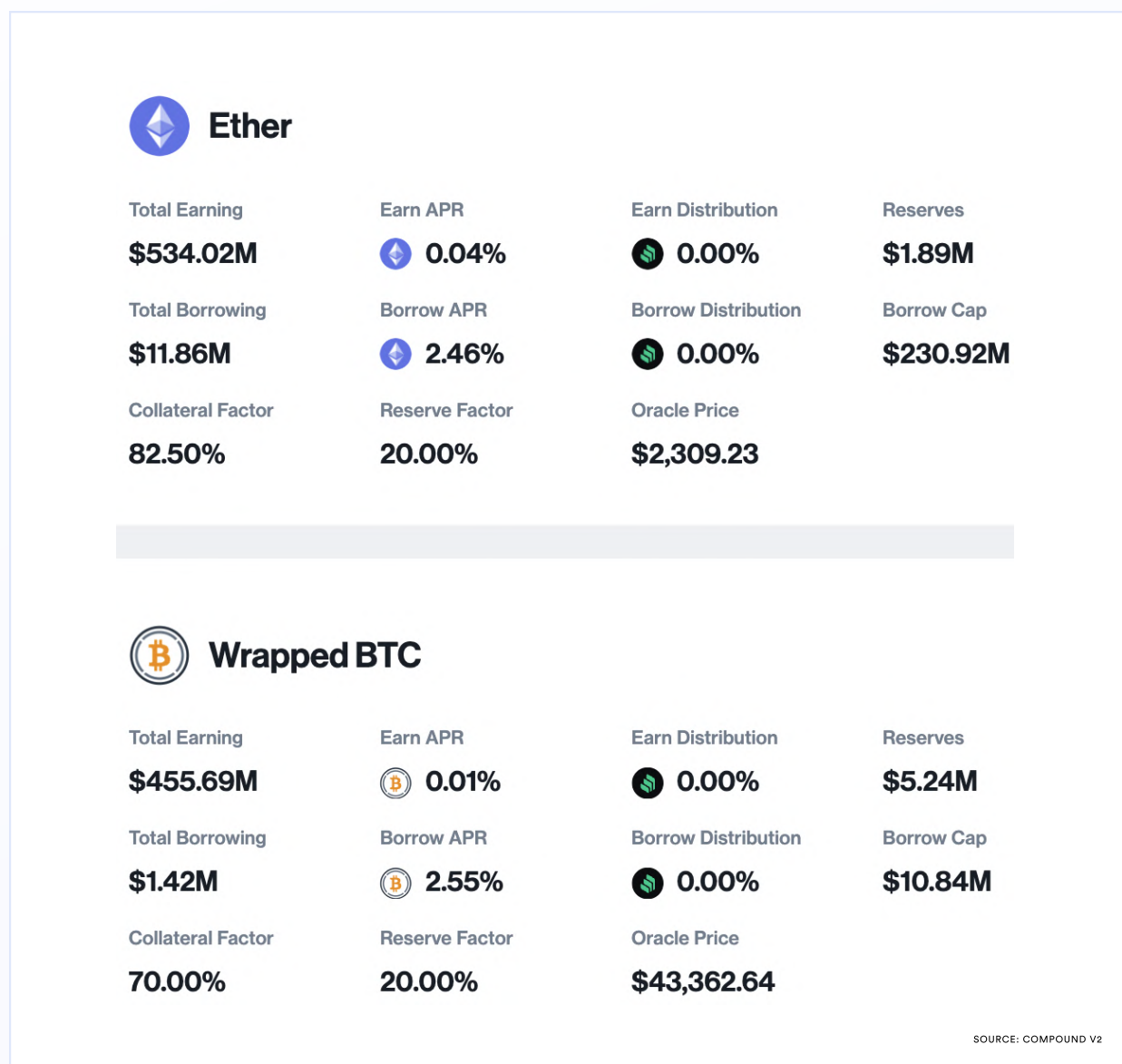
Source: defillama.com

Aave, a leading DeFi lending protocol, currently has about \$8.6B of assets locked and \$2.9B borrowed across all blockchains where the protocol is deployed (see chart below.)



To mitigate the risk of default, DeFi protocols require loans to be **overcollateralized**, meaning that borrowers must lock up more collateral assets than the value of the loan they wish to access. This approach safeguards lenders and the stability of the lending platform as it provides a cushion in case the collateral's value fluctuates or if borrowers fail to repay their loans. It also minimizes the need for credit checks or identity verifications and maintains the trust-minimized nature of the system.

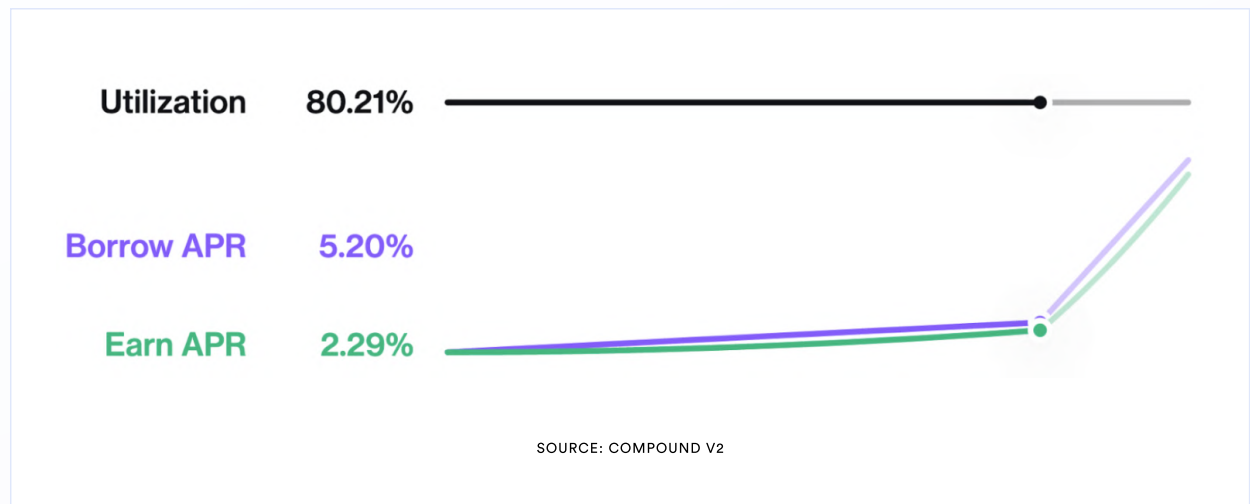
The maximum amount of tokens that can be borrowed against a collateral token is usually called the **collateral factor (“CF”)** and is akin to the loan-to-value limit in traditional banking. While the latter sets LTV limits based on factors like individual creditworthiness and the type of loan, DeFi lending protocols generally set CFs based almost entirely on the perceived riskiness of the collateral asset. The riskier an asset, the less a user can borrow against it (i.e., the lower the CF for that asset). The image below shows Compound v2’s parameters for ETH and Wrapped BTC; note the collateral factors on the bottom left corner for each.



Lending and borrowing interest rates offered by lending protocols are determined by factors fundamentally different from those offered by traditional banks. For banks, rates are largely determined by central bank policy, individual credit risk, and economic conditions. In DeFi lending, rates are set algorithmically based on supply and demand dynamics for specific assets. For instance, if an asset is borrowed heavily relative to its supply in the lending pool, its borrow rate will rise. This is meant to help the protocol maintain an interest rate equilibrium for each asset. This also means that DeFi lending rates potentially offer exposure that is uncorrelated to rates in traditional markets.

The rate policies on major lending protocols are represented by **interest rate curves** that rise as more of a token pool has been borrowed (i.e., the utilization of the liquidity pool is higher). Further, many protocols use a “jump rate” model where the slope of the interest rate curve jumps significantly past a certain utilization (“optimal utilization” or the “kink”) with the intention of returning utilization to an equilibrium. One danger in excessively high utilization is that liquidity suppliers may be unable to withdraw their tokens.

The chart below shows an example of interest rate curves on Compound v2. The x-axis represents utilization and the y-axis represents APR.



As loans on all major DeFi protocols are overcollateralized at the time of this writing, this means that the CFs for all collateral tokens are less than 1 (and greater than or equal to 0). It should be noted that DeFi protocols do not run themselves (though the underlying smart contracts could theoretically run indefinitely). While decentralization is a guiding tenet of DeFi, the protocols are generally managed by a core group of contributors dedicated to the protocol’s maintenance, growth, and risk management. Further, the parameters of a protocol are not automatically set by smart contracts, but rather they are set by the protocol’s community through a voting process, which is part of a larger aspect of protocols called “governance.” Community members can propose changes to parameters, which are then enacted if approved by the community.

DeFi lending is somewhat comparable to the repo markets in traditional finance, where participants have access to short-term financing through collateralized borrowing at rates determined by supply and demand for the collateral (among other factors). In addition to the differences already outlined, borrowing in DeFi does not necessarily have a maturity date.

Risk Management in DeFi Lending

Banks mitigate the risk of bad loans through measures like rigorous underwriting procedures, credit insurance, and loan loss reserves accrued from earnings. In the case of systemic failures, the financial system is backstopped by central authorities like the Federal Reserve. By contrast, due to the trustless nature of DeFi, lending protocols cannot assess the creditworthiness of borrowers and are not backstopped by a central authority. While lending protocols mitigate risk through overcollateralization, this approach may be insufficient in preventing loans from becoming undercollateralized during market dislocations, which can endanger lenders and the overall stability of the lending protocol.

When a DeFi loan becomes undercollateralized, the borrower's account can be **liquidated**. For most major lending protocols, liquidation is a process whereby anyone can pay back the debt of an undercollateralized account in exchange for an equal amount of the account's collateral. This ensures that lenders are made whole and the integrity of the protocol remains stable. As an incentive to perform the liquidation, the liquidator also receives a reward ("liquidation bonus" or "liquidation factor") in the form of some of the remaining collateral. As long as the bonus is higher than the cost of performing the liquidation, liquidators are incentivized to act on undercollateralized accounts, thus mitigating risk to the lending protocol.

In some cases, liquidations might fail to occur. The liquidation bonus might not be enough to compensate for the trading costs of liquidating an account, liquidators might not have access to the borrowed token, or liquidators perceive the collateral asset as too risky and thus do not want to receive it. If an undercollateralized account is not liquidated, the account's borrowed amount becomes **bad debt** (also called insolvencies) for the protocol, leaving lenders underwater. While lending protocols do not follow a standard for dealing with bad debt, many protocols build reserves from borrow fee revenue for the primary purpose of paying for future bad debt.

Given these issues, DeFi lending protocols must continually adjust parameters, such as collateral factors and lending and borrow rates, so that users are encouraged to supply and borrow tokens without adding undue risk to the protocol.

The Importance of Chainlink Oracles in DeFi

A major challenge of blockchain technology is the oracle problem. Simply put, blockchain applications cannot natively see data from (or push data) outside the blockchain network. While this makes certain aspects of blockchain secure and reliable, it also limits the capabilities of many applications. In particular, financial protocols heavily rely on the pricing information of assets; if a user wants to borrow or lend assets on a DeFi lending protocol, the protocol must first accurately determine the value of the debt and collateral. Chainlink supplies this critical data to blockchain applications through its price oracles. Nearly all the functions and policies of lending protocols today are underpinned by token price data, which allows protocols to not only assess asset value, but also to set appropriate collateral factors and interest rates, measure loan-to-value ratios, calculate utilization, and ultimately manage capital efficiency.

The accuracy and robustness of oracles are especially critical to protocols in the extreme case of market manipulation attacks, which can potentially drain a protocol of all its value. Chainlink's architecture is decentralized, with credibly-neutral infrastructure that utilizes multiple layers of data aggregation to mitigate the risk of a single point of failure or any reliance on a single source of truth that could be corrupted. This ensures Chainlink Price Feeds provide full market coverage that reflects the true market value of assets.

Today, Chainlink oracles are the clear market leader across DeFi protocols with about \$24B in total value secured across all blockchains, compared to \$43B in total addressable value in DeFi. Nearly all of the major lending protocols, including Aave and Compound, utilize Chainlink Price Feeds to support their functionality. The table below shows the 10 largest protocols by TVL that use Chainlink oracles across all blockchain networks.

Top 10 DeFi Protocols Using Chainlink Oracles

Project	Chains	Category
Aave V3	10	Lending
Aave V2	3	Lending
Spark	2	Lending
Compound V3	4	Lending
Compound	1	Lending
Venus Core Pool	1	Lending
Liquity	1	CDP
Dydx	1	Derivatives
Morpho Aave	1	Lending
Radiant V2	3	Lending

Source: defillama.com

Not only does Chainlink enable blockchains to overcome the oracle problem, but it also helps chains unlock advanced use cases since Chainlink's platform encompasses a multitude of services; this in turn encourages growth in developers for those chains.

Challenges in DeFi

DeFi has faced some challenges in recent years. In 2022, prominent price manipulation attacks plagued DeFi protocols, with Mango Markets notably losing about \$110M in value. The attack on Mango involved the aggressive purchasing of an illiquid token on a decentralized exchange to push its price up, using the overvalued token as collateral on the Mango protocol, and finally borrowing as much against it as possible. This removed nearly all of the assets on Mango Markets (except for the manipulated token).

On July 30 of 2023, DEX Curve Finance suffered a hack of about \$50M, causing a decline in the protocol's CRV governance token. This caused a ripple effect where a large loan backed with CRV tokens became at risk of liquidation. Because of the large size of the position, a liquidation of that account could have caused significant bad debt for the lending protocol where that position resided. With CRV's price declining and liquidity drying up, liquidators would not have wanted to receive CRV and likely would have avoided liquidating the position altogether. The account's user stabilized their position by adding collateral and paying down some debt.

The reliability and robustness of price oracles are critically important in volatile markets, as extreme volatility for even as short as 10 minutes can severely impair a protocol. Liquidations, which help maintain the stability of a protocol, rely on the accurate and up-to-date valuation of both collateral and loans; inaccurate price oracles can disrupt liquidations, lead to unnecessary liquidations, or even cause bad debt for the protocol. Chainlink's decentralized oracle network mitigates the risk of a single point of failure by aggregating sources of data from multiple providers, making price oracles resilient to data inaccuracies or manipulation by a single entity.

Recent Innovations in DeFi Lending

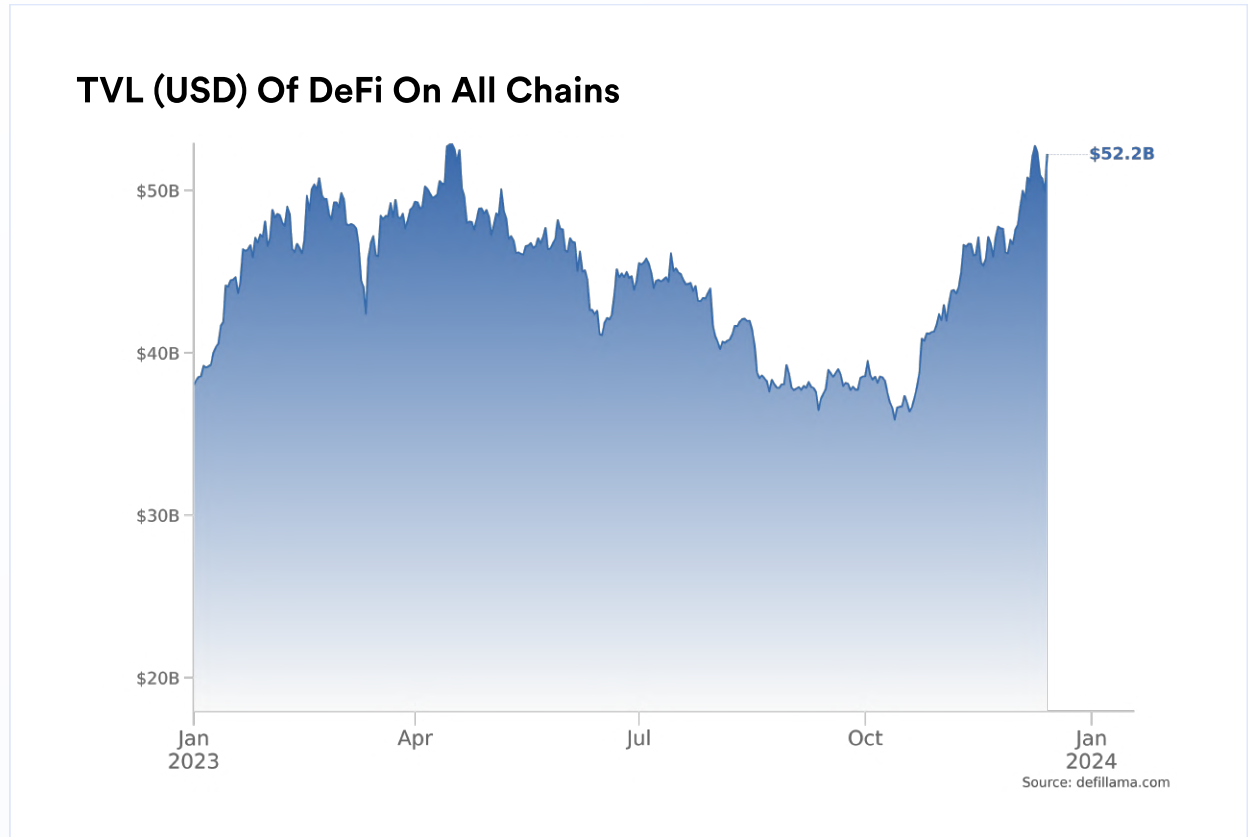
As DeFi protocols compete for assets, they are constantly upgrading features in order to manage risk and growth. For example, Aave v3 introduced several new features, including:

- **Isolation mode:** This enables Aave to list new assets as isolated assets, where the asset's use is limited in that other assets cannot be used as collateral at the same time, only certain stablecoins can be borrowed, and a debt ceiling limits the total amount a user can borrow against an isolated asset.
- **High-efficiency mode:** This gives users higher borrowing power when supplying a collateral token that is highly correlated to the borrowed token.

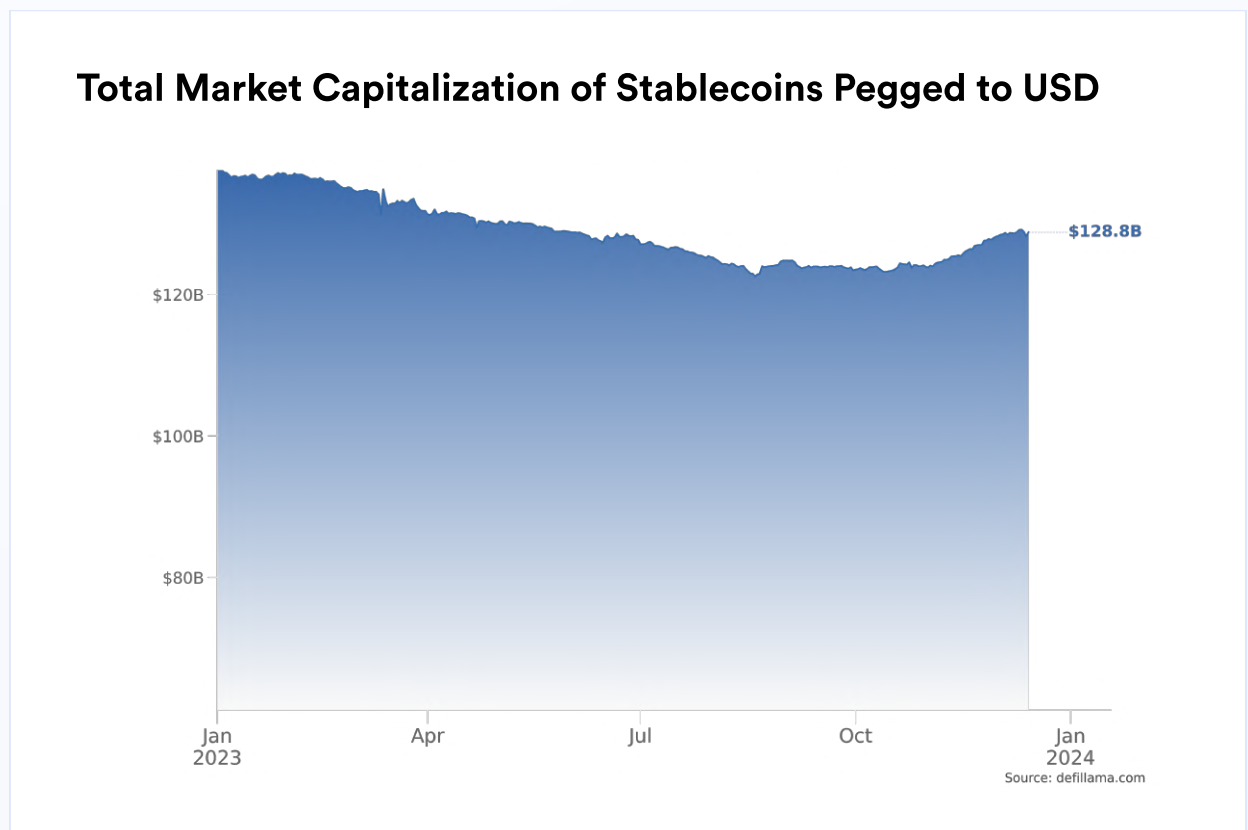
Compound v3 also made changes from v2 by limiting the tokens that can be borrowed and supplied as collateral. Not only does this reduce the attack vectors that can drain the protocol, but it also enables the protocol to allow users to borrow more against their collateral. We note that Compound v3 utilizes Chainlink as the exclusive price oracle, which supports scalability since it is portable to EVM chains beyond Ethereum.

DeFi Trends in 2023

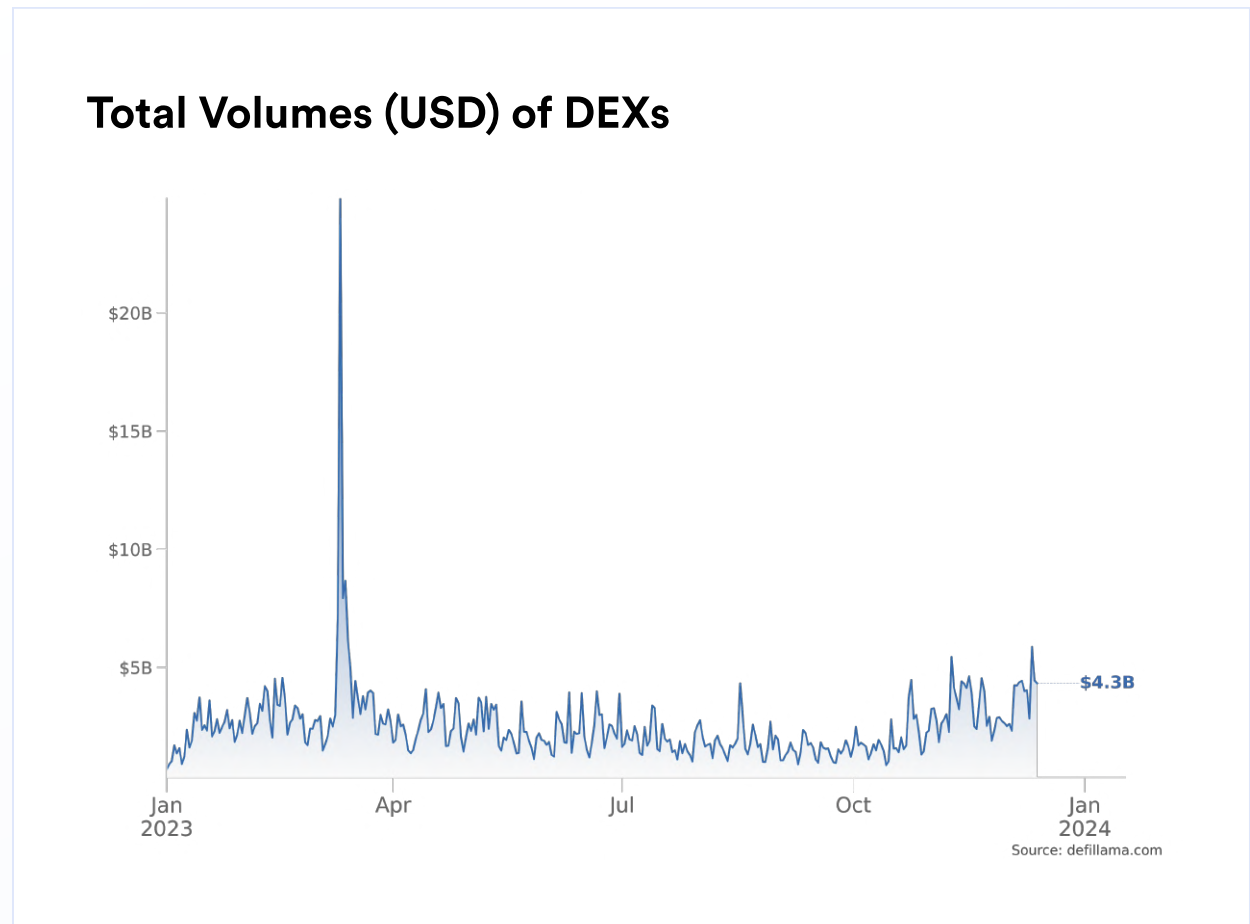
In 2023, the TVL in the DeFi ecosystem trended negatively for most of the year until October, when prices began to recover and helped TVL reach about \$52.2B (excluding liquid staking and double counted TVL) in December:



The market capitalization of stablecoins pegged to the U.S. dollar followed a similar trend, hitting roughly \$128.8B in December:



Total DEX daily trading volumes have been somewhat steady at around \$3-4B throughout most the year:



It is worth noting that centralized exchanges saw net positive inflows of about \$4.7B in 2023 despite negative sentiment impacting the industry. When Binance settled with the U.S. government for \$4B in late November, the exchange saw outflows of \$2.2B in a single week. Flows recovered, however, with Binance seeing \$3.4B in inflows in the first two weeks of December.

We discuss the topic of yields in the next section, where we not only cover 2023 trends but also recognize the diversity of DeFi yields, warranting a more thorough comparison across protocols and asset classes.

Yields in Decentralized Finance

DeFi offers several methods to earn yield.

- **Lending:** As discussed, lending protocols enable users to lend tokens at rates determined by the borrow utilization of those tokens.
- **Staking:** DeFi users have many options to stake their cryptocurrency into a smart contract in exchange for rewards. One fundamental example is seen in blockchain networks that utilize proof of stake, where validators stake cryptocurrencies native to the network, verify transactions and blocks, and receive rewards for doing so. Staking protocols like Lido enable users to stake their ETH in exchange for staked ETH (stETH), which can be traded on other DeFi platforms (while still earning rewards). This approach is referred to as “liquid staking” since users retain liquidity while earning staking rewards.
- **Market making:** Users can provide liquidity to an autonomous decentralized exchange in return for a portion of the fees charged by the exchange.
- **Yield strategies:** Several other strategies allow DeFi users to significantly enhance their returns on capital beyond the yield opportunities mentioned above. One such strategy is recursive borrowing (sometimes called leveraged lending), where a user:
 - i. Deposits stETH, for instance, on a lending protocol to borrow ETH at max LTV.
 - ii. Deposits ETH into Lido in exchange for stETH (while earning staking rewards).
 - iii. Recursively deposits stETH into the lending protocol again to borrow ETH.

This last yield strategy is popular on Aave v2 and v3 on Ethereum, where stETH is the most supplied token and ETH is among the most borrowed tokens.

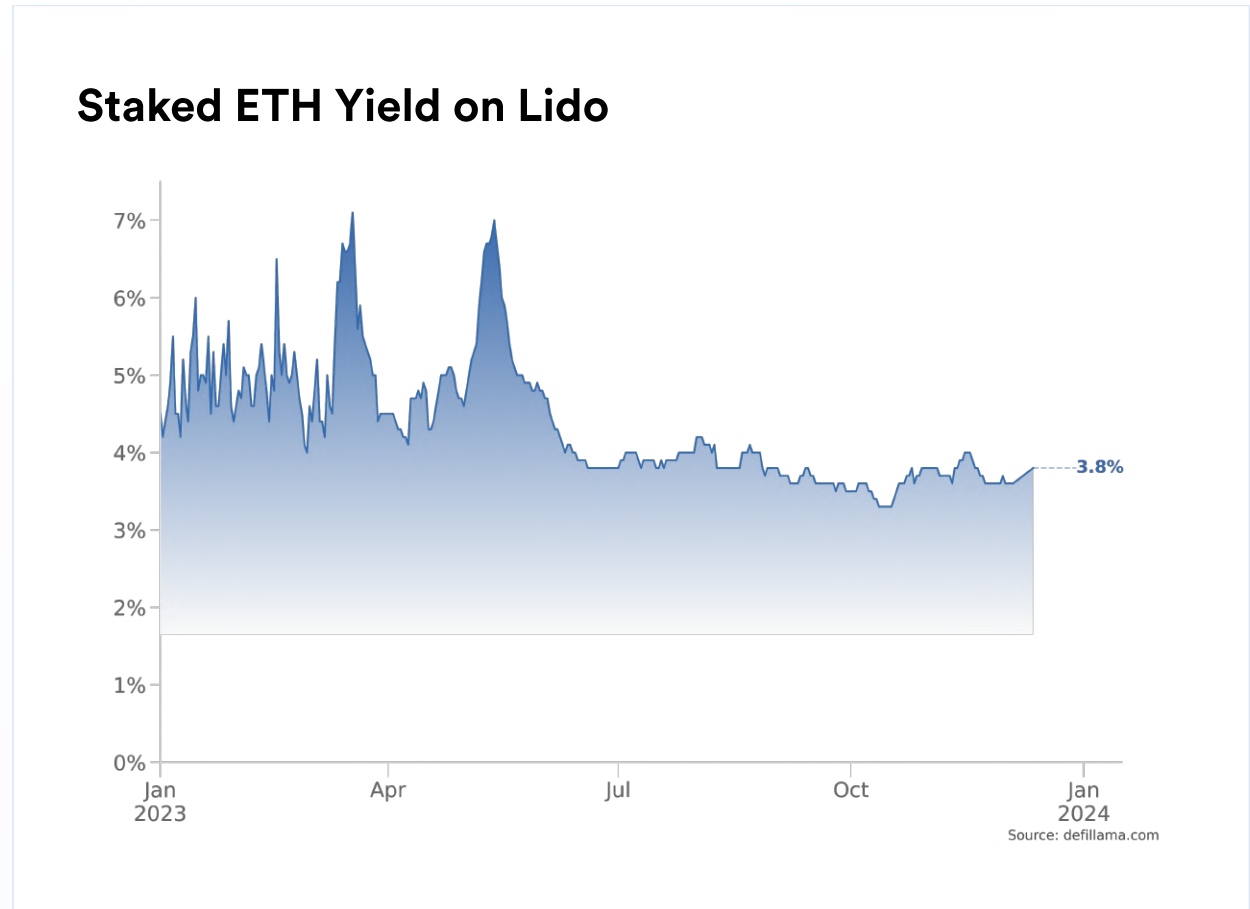
Given the diverse yield ecosystem in DeFi, it is not clear how to aggregate yields in a logical, consistent manner. A simple approach would be to look at the largest liquidity pools and the yields they offer, but this approach shows a wide range of APYs. Below are the top five DeFi liquidity pools by TVL and their respective yields (not including liquid staking derivatives yields).

Top Five DeFi Liquidity Pools By TVL

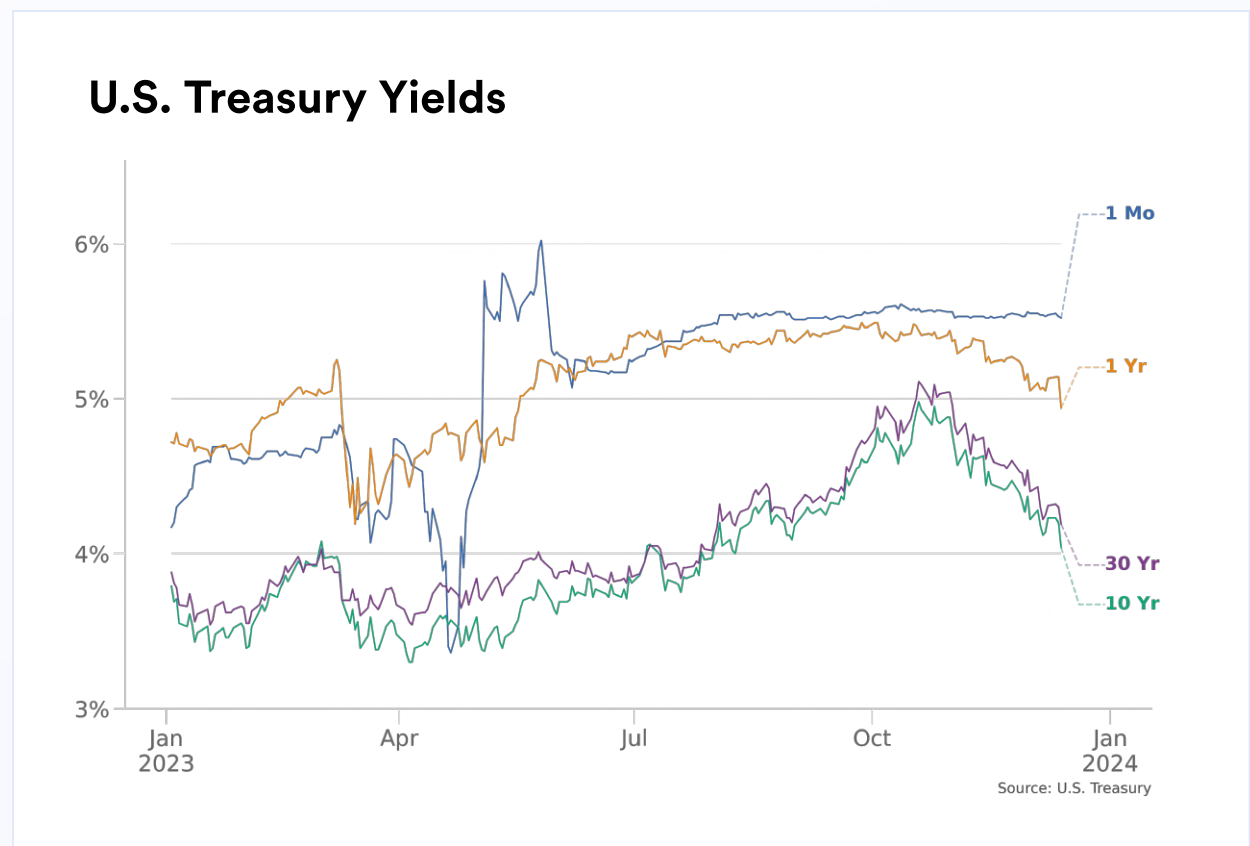
Pool	Project	TVL (USD)	APY	Chain
STETH	Lido	\$19,996,427,138	3.80%	Ethereum
HODL-WAVAX	Joe V2.1	\$5,912,707,767	0.00%	Avalanche
BTC	Justlend	\$4,350,924,596	0.00%	Tron
RETH	Rocket Pool	\$2,406,097,420	3.65%	Ethereum
WSTETH	Aave V3	\$2,007,866,297	0.00%	Ethereum

Source: defillama.com

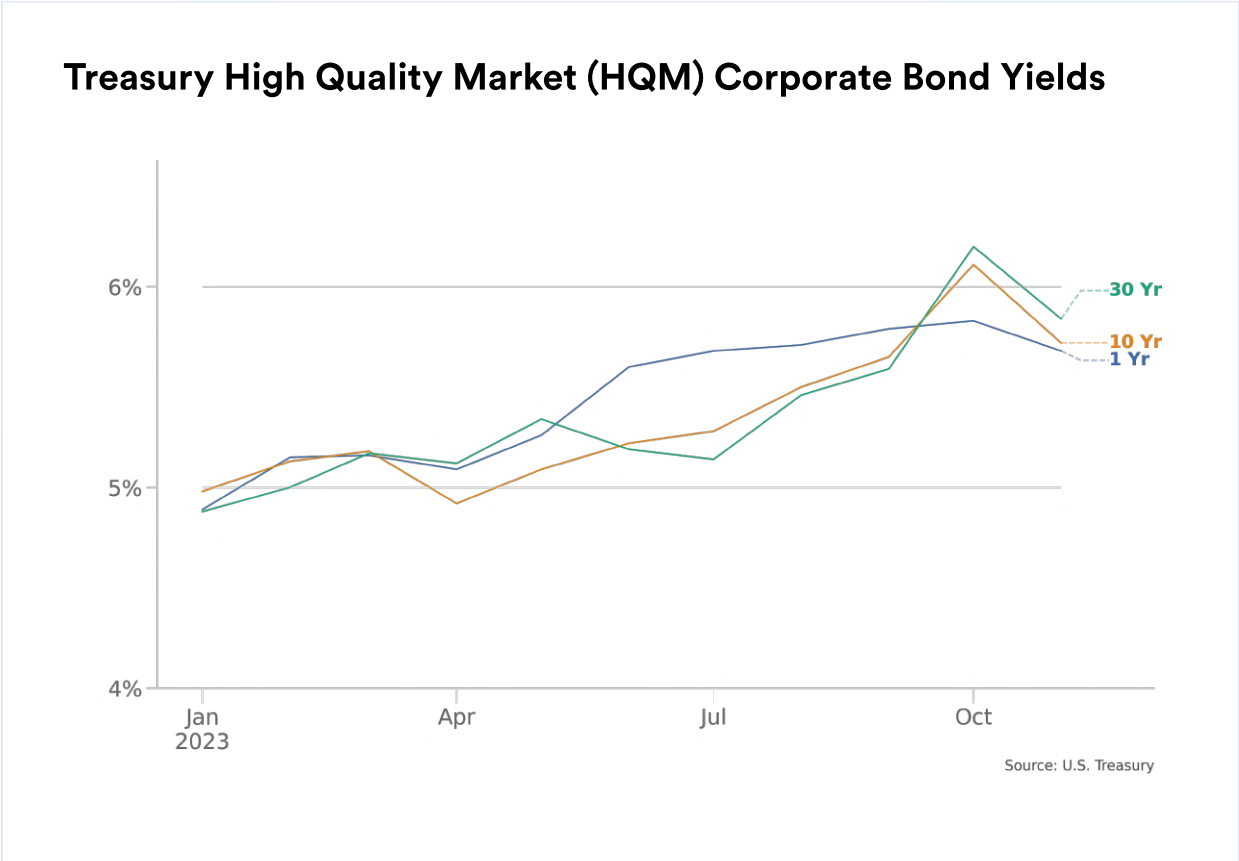
On Lido, the largest liquidity pool by TVL, the yield for stETH was volatile early in 2023 but has been somewhat stable since June at around 3.8%:



This compares to US Treasury yields last year, some of which began to decline in December:



It also compares to high quality (rated A and above) corporate bond yields last year:



The Need for a DeFi Yield Index

As elevated global interest rates pushed yields higher in financial markets compared to some yields seen in DeFi, the total value locked (“TVL”) across all of DeFi in October last year declined to \$42B, the lowest level since February 2021. That said, the difficulty in comparing yields in traditional financial markets with those in DeFi is that there isn’t a comprehensive yield index for DeFi, as it is difficult to encapsulate DeFi yields into one number. Also, DeFi does not have a definitive base rate directly analogous to the federal funds rate in traditional markets, as one rate in DeFi does not unilaterally impact all other rates. In addition, it is difficult to aggregate DeFi yields as protocols constantly evolve and the categories of protocols are diverse, making strategies that offer yield (and the determining factors of these yields) vary widely. In the table below, note the wide range of APYs of the top 10 stablecoin pools for USDC—even USDC’s yield on Aave v2 is different from that on Aave v3.

Yields For Ten Largest USDC Pools by TVL

Project	Pool	TVL (USD)	APY	Chain
Goldfinch	USDC	\$78,640,810	7.76%	Ethereum
Tectonic	USDC	\$51,768,135	2.74%	Cronos
Aave V3	USDC	\$42,515,901	6.80%	Ethereum
Morpho Aave	USDC	\$41,078,114	10.30%	Ethereum
Solv Funds	USDC	\$30,200,426	14.17%	Arbitrum
Credix	USDC	\$30,076,504	10.34%	Solana
Compound	USDC	\$29,582,904	9.51%	Ethereum
Aave V2	USDC	\$29,012,889	8.66%	Ethereum
Across	USDC	\$28,883,294	13.75%	Ethereum
Stargate	USDC	\$24,251,662	8.33%	Ethereum

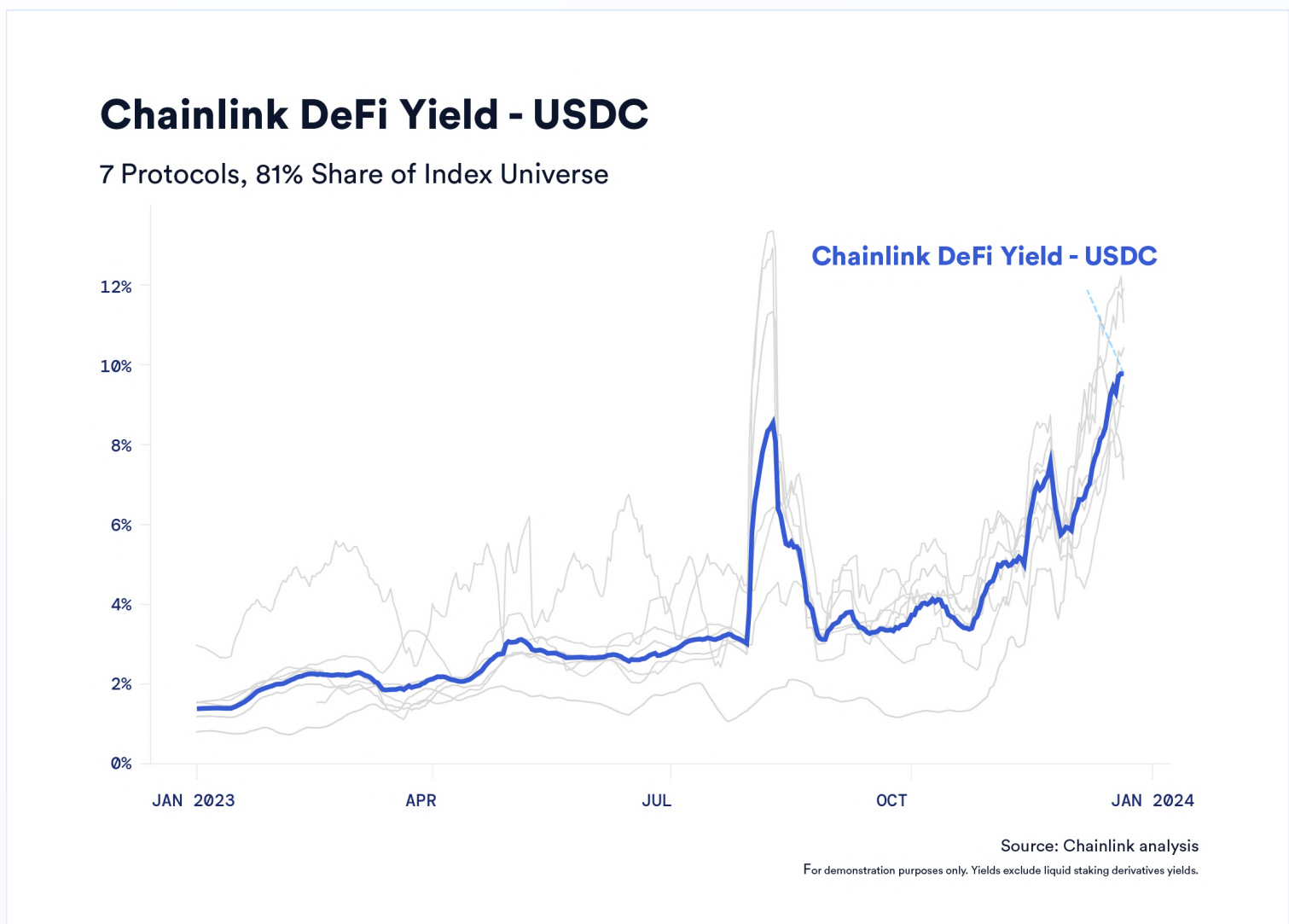
Source: defillama.com

That said, aggregating diverse sources of information into a representative dataset is at the core of what Chainlink does. A properly executed DeFi yield index would give traditional finance participants a window into the opportunities in DeFi and help them evaluate new ways to earn yield, manage risk, and ultimately deploy capital efficiently. In turn, components of the index (i.e., protocols) would benefit from the influx of new capital into their liquidity pools. Higher liquidity then helps lower transaction costs, which helps attract more participants. Thus, a DeFi yield index could provide value to both the TradFi and DeFi ecosystems.

The Chainlink DeFi Yield Index

We are excited to be developing the Chainlink DeFi Yield (“CDY”) Index, which aggregates DeFi lending yields enabled by Chainlink price oracles and is designed with a focus on accuracy, robustness, and market representativeness. By promoting the discoverability of onchain yield opportunities on lending protocols, the CDY Index is poised to enhance capital efficiency for both DeFi and TradFi participants. Below, we showcase the CDY Index for the largest, most liquid crypto markets on the most active, popular lending protocols. For a description of the methodology used for calculating the CDY, see the appendix.

The following chart shows the **CDY-USDC** index for lending protocols that collectively comprise at least 80% of the TVL of the USDC index universe.



This example utilizes an observation span of ten days and a segment span of one day—see the appendix for definitions of the CDY’s parameters. The gray lines represent the lending rates for USDC on individual lending protocols (calculated by the approach in the appendix), and the blue line represents the Chainlink DeFi Yield for USDC.

Despite market volatility in various parts of the year, major lending protocols like Aave and Compound stood resilient during the depeg through active risk management, demonstrating the robustness of protocols that have active communities monitoring macro and idiosyncratic risks. The hack of decentralized exchange Curve Finance on July 30 led to rippling volatility (as seen in the chart) as the decline in Curve's governance token CRV raised the risk of liquidations of positions using CRV as collateral, which could have led to significant losses for lending protocols. USDC suppliers quickly decreased their supplied tokens on lending protocols, causing the USDC lending rate to rise. Finally, USDC lending yields have generally risen in recent months as the borrow utilization of USDC has increased on lending protocols.

The protocols below show the constituents of the CDY-USDC index under these hypothetical parameters.

Constituent Protocols: CDY-USDC



Compound (Ethereum)



Compound V3 (Ethereum)



Aave V2 (Ethereum)



Aave V3 (Ethereum)



Morpho Aave (Ethereum)



Radiant V2 (Arbitrum)



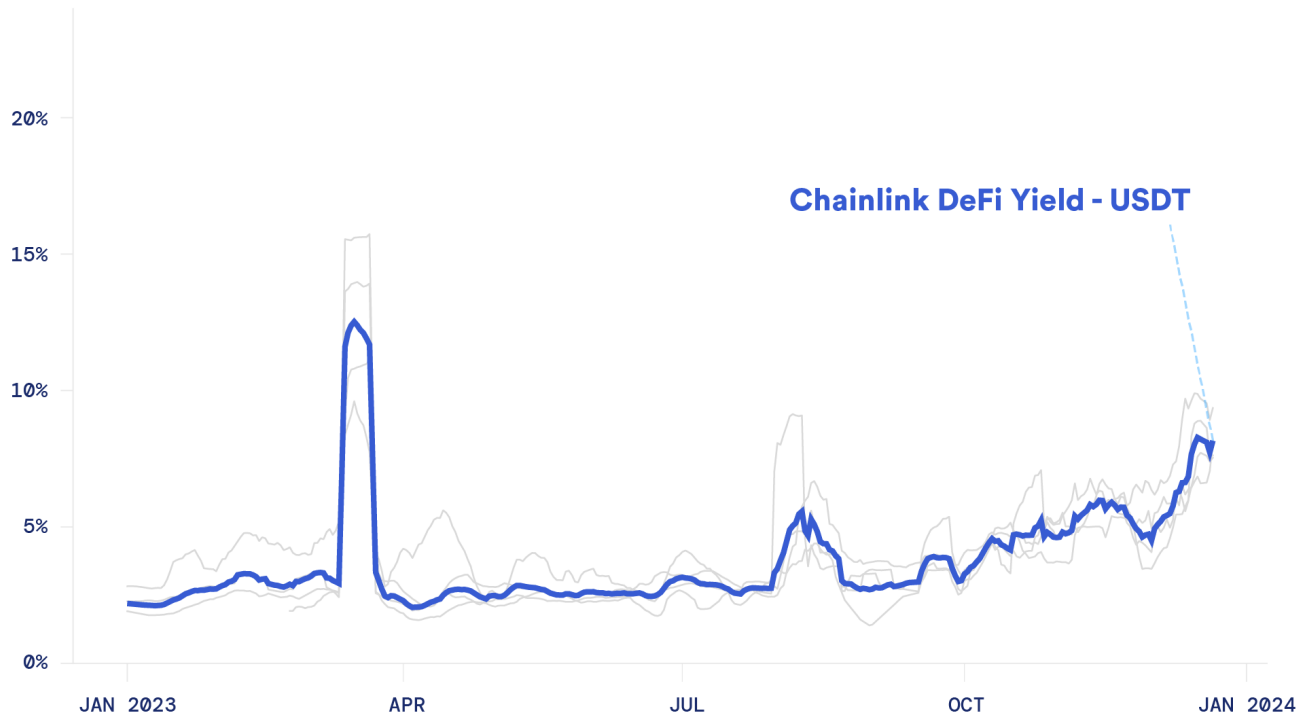
Venus Core Pool (BSC)

For demonstration purposes only.

The next chart reflects the **CDY-USDT**, applying the same parameters as CDY-USDC.

Chainlink DeFi Yield - USDT

4 Protocols, 83% Share of Index Universe



In March, surging demand for USDT led to higher lending rates. The lending rate later declined as USDT supply caught up with borrowing demand. In response to the CRV volatility in late July, USDT lending rates rose as USDT suppliers pulled their liquidity from lending protocols. In recent months, the USDT lending rate has risen as USDT borrow utilization has steadily increased. The constituents for CDY-USDT in this demonstration are illustrated below.

Constituent Protocols: CDY-USDT



Compound (Ethereum)



Aave V2 (Ethereum)



Aave V3 (Ethereum)



Morpho Aave (Ethereum)



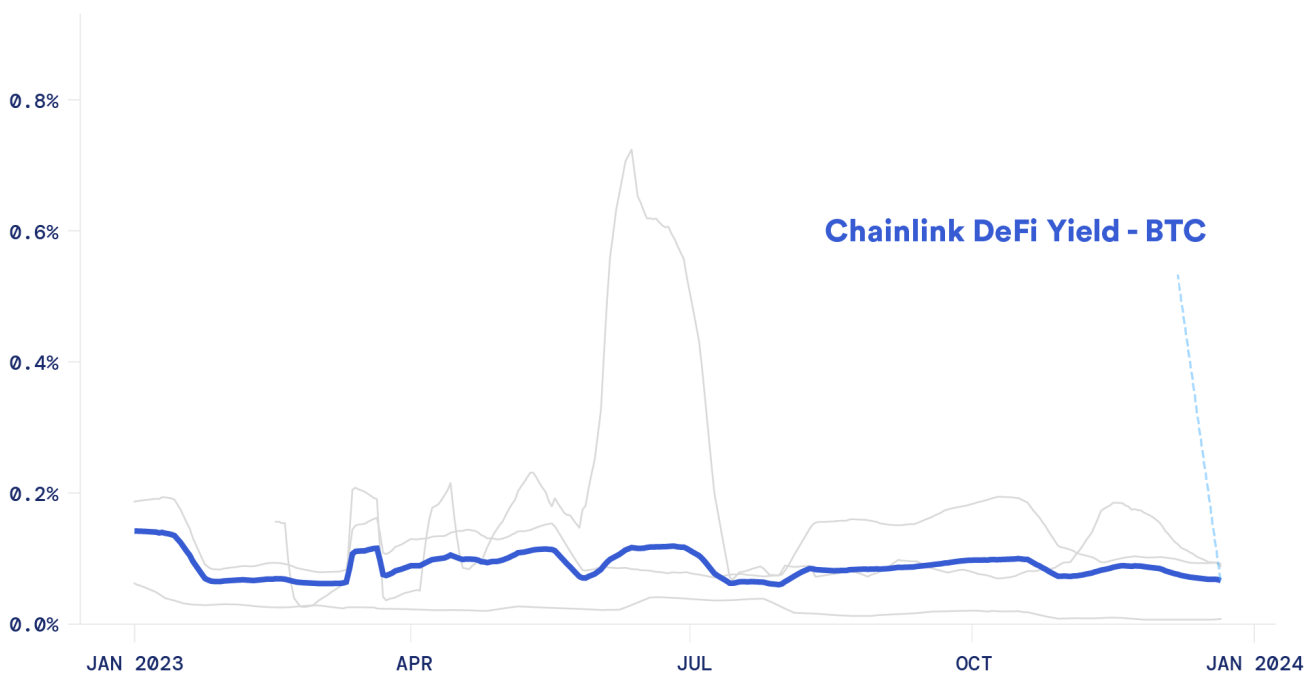
Venus Core Pool (BSC)

For demonstration purposes only.

The chart below shows the **CDY-WBTC** index, where three lending protocols comprise over 80% share of the index universe's TVL.

Chainlink DeFi Yield - WBTC

3 Protocols, 83% Share of Index Universe



Source: Chainlink analysis

For demonstration purposes only. Yields exclude liquid staking derivatives yields.

The lending rates for WBTC are very low because WBTC's borrow utilization is subdued. This is because "blue-chip" tokens like WBTC are primarily used as collateral assets—since they are relatively stable and have high collateral factors, they allow users to borrow more tokens against them. This pattern is noticeable on major lending protocols like Aave v3 and Compound v2, where blue-chip tokens like WBTC, WETH, and wstETH are among the most supplied tokens, while stablecoins like USDT and USDC are among the most borrowed tokens.

Below are the constituents of the CDY-WBTC index.

Constituent Protocols: CDY-WBTC



Compound (Ethereum)



Aave V2 (Ethereum)



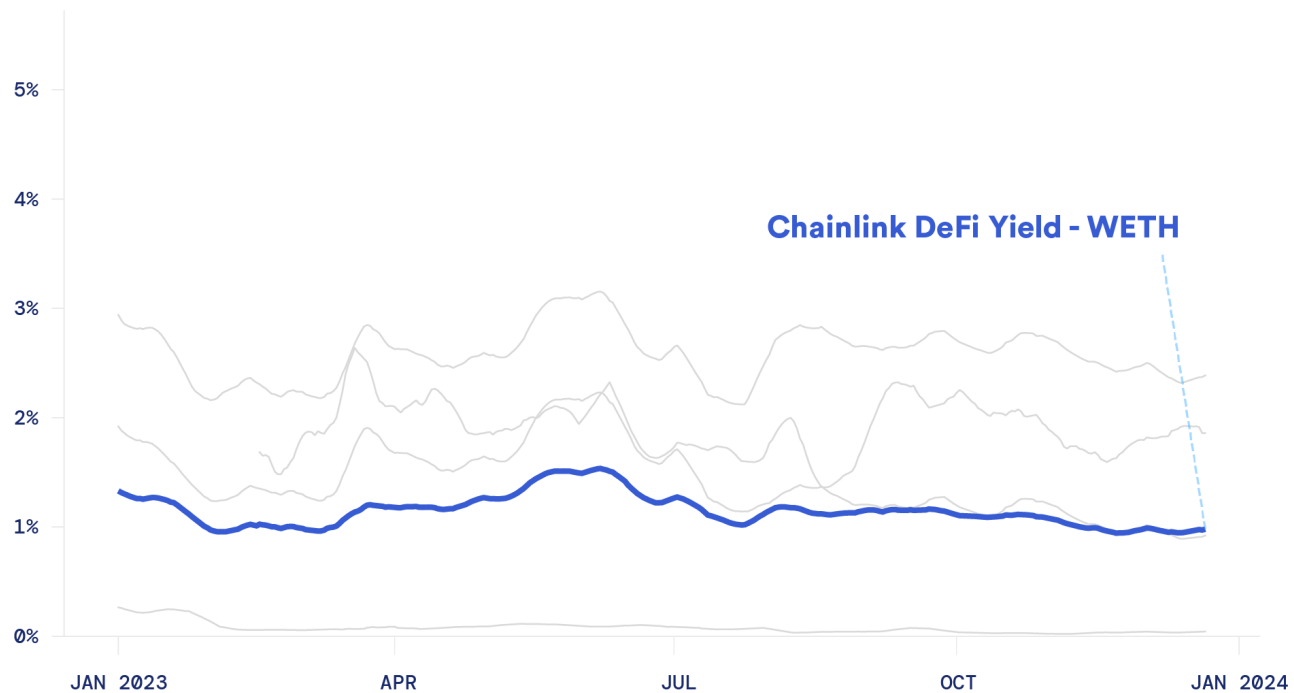
Aave V3 (Ethereum)

For demonstration purposes only.

The final index below is **CDY-WETH**, where four protocols comprise over 80% of the index universe's TVL.

Chainlink DeFi Yield - WETH

4 Protocols, 82% Share of Index Universe



Source: Chainlink analysis

For demonstration purposes only. Yields exclude liquid staking derivatives yields.

The lending rates for the constituents in CDY-WETH range between 1-3% with the exception of WETH on Compound v2 on Ethereum, which is near 0%. Compound v2 is an attractive venue for users with WETH because WETH can be supplied (deposited for yield) and used as collateral to borrow several other tokens. This contrasts with Compound v3 on Ethereum, where WETH can be supplied and only used as collateral to borrow USDC (as of late 2023). As Compound migrates users from v2 to v3 and encourages WETH supply on v3, it has set higher WETH supply yields on v3 compared to those on v2.

The constituents for CDY-WETH are shown below.

Constituent Protocols: CDY-WETH



Aave V2 (Ethereum)



Aave V3 (Ethereum)



Compound (Ethereum)



Morpho Aave (Ethereum)

For demonstration purposes only.

Conclusion

Decentralized finance is a vibrant ecosystem in which developers continue to innovate in the face of challenges—in response to each systemic or idiosyncratic setback, the DeFi community iteratively develops features that enhance security and capital efficiency. As DeFi becomes more robust and higher borrow utilization results in more attractive yields onchain, users in traditional finance will need a clear and reliable window into the DeFi ecosystem in order to participate in those opportunities. While TradFi has established indexes that reflect macroeconomic activity, DeFi has yet to create such aggregated data sources. Yet, constructing a DeFi yield index requires knowledge of what drives rates on protocols and expertise in accurately aggregating rates in a way that is representative of the lending market. Chainlink is substantially qualified to do both, given 1) the platform is deeply embedded in DeFi, and 2) Chainlink’s decentralized aggregation methodologies have proven to be accurate and robust. The Chainlink platform has enabled trillions of dollars of transactions across DeFi, insurance, gaming, NFTs, and other major industries, supporting developers in developing feature-rich Web3 applications and providing global enterprises with a universal gateway to all blockchains. Further, the Chainlink DeFi Yield Index will include the most active, popular lending protocols supported by Chainlink price oracles.

The Chainlink DeFi Yield Index marks a pivotal opportunity for both TradFi and DeFi ecosystems:

- **Capital allocators** will discover yield opportunities they previously did not consider before. The CDY Index will give TradFi participants a window into DeFi and help them evaluate new ways to earn yield, manage risk, and ultimately deploy capital efficiently.
- **Constituent lending protocols** in the index will benefit from new inflows facilitated by the CDY Index. More assets available for lending will lead to higher fee revenue for the protocols, which can be used to enhance protocol features, security measures, and overall user experience. This in turn will foster confidence among the users of the protocols.
- **Users of the constituent lending protocols** will benefit from higher liquidity as new inflows lead to deeper liquidity pools, reducing slippage and providing users with better access to loans or the ability to exit positions more efficiently. These benefits will attract more borrowers, leading to higher revenues for the protocols and potentially higher yields for liquidity providers.

Reach out to our team of experts

To find out how your organization can benefit from the Chainlink DeFi Yield Index, [reach out to our team](#).

Appendix: Aggregating Lending Rates— Methodology Overview

Motivation

This methodology serves as a guiding tool for users, institutions, and other stakeholders to gain insight into the DeFi lending landscape. It offers a transparent and consistent approach to assessing the performance and dynamics of token lending rates across the most popular and active DeFi platforms supported by Chainlink oracles.

To start, an index that tracks yields on lending protocols makes sense because the lending rates of a given token are simply determined by the supply and demand forces for that token in the lending ecosystem. Also, there is empirical evidence that rates on DeFi lending protocols influence each other, while DeFi lending and crypto futures markets are segmented.

Terminology

- **Aggregate lending rate:** The aggregated lending rate for a token calculated with the methodology enumerated below.
- **Reference moment:** The timestamp at which an aggregate lending rate is determined.
- **Observation span:** The duration leading up to the reference moment during which transaction data is collected for analysis. This should be short enough to capture rapid changes but long enough to smooth out extreme fluctuations.
- **Segment span:** The duration of segments into which the observation span is divided. Partitioning the observation span allows us to capture variations in the relationships between rates and TVLs across different segments.

Index Universe

- The aggregate rates should be representative of the overall DeFi lending market, which means they should capture large and liquid constituents. Thus, there should be an active, transparent market for interacting with these rates. Liquidity helps participants minimize trading costs and change positions without significant market impact. Including very small constituents can add a burden to participants who wish to replicate the aggregate rates; transaction costs would be higher, and tracking numerous holdings requires additional resources and may introduce complexity in rebalancing and overall management.
- Further, stability and reliability are key factors in any index's performance since unstable pricing methodologies can introduce volatility and distort the overall representation of the market. Therefore, the index universe for aggregate rates includes protocols that utilize robust, manipulation-resistant price oracles—i.e., Chainlink oracles. Depending on the token, about 70-80% of total value locked on DeFi lending protocols is secured by Chainlink oracles.

Threshold Requirements

To ensure 1) the aggregate lending rate is representative of an active, liquid lending market and 2) operational costs and complexity of maintaining the aggregate lending rate are not a burden, the aggregate lending rate imposes a minimum aggregate market share of the index universe for protocols to be included. For instance, if the minimum market share is 80%, then the index will consist of the largest protocols whose total market share of the index universe totals at least 80%. Depending on market conditions, this minimum threshold may vary by token and may change over time.

Assets

The Chainlink DeFi Yield (“CDY”) Indexes will initially be calculated for the largest, most liquid crypto markets.

- USDC (CDY-USDC)
- USDT (CDY-USDT)
- Wrapped BTC (CDY-WBTC)
- Wrapped ETH (CDY-WETH)

Approach

For a given token secured by a Chainlink oracle on a given protocol, the Chainlink DeFi Yield Indices reflect the value-weighted mean of the supply APYs, weighted by the value of the token’s supply on that protocol. For a given protocol and token, the calculations are as follows:

1. At the reference moment, segment all pertinent data points observed during the observation span into N segments of uniform segment span.
2. Calculate the value-weighted mean rate within each segment.
3. Calculate the average of the rates across the N segments in the observation span, applying exponential weighting in order to emphasize more recent observations over older ones.

After applying steps 1-3 for the relevant protocols, calculate a value-weighted average of all the protocols’ rates at the reference moment to derive the aggregate supply rate. The value weight for a protocol should be the average of the token’s supply value across the observation span. If a lending protocol has a fixed rate APY and a variable rate APY, the calculation is performed for both APYs separately.