GRAYSCALE

Fundamental Value in Crypto

Fundamental Value in Crypto Part II: Valuing Smart Contract Platforms

INTRODUCTION

For illustrative purposes only and are used to depict examples of smart contract platforms

Smart contract platforms (SCPs) like Ethereum (ETH) are often referred to as distributed computers, whereas payment cryptocurrencies like Bitcoin – discussed in part one of our series – are simpler distributed ledgers. In this piece, we'll break down the unique characteristics of smart contract platforms, discuss how their native tokens vary from traditional payment cryptocurrencies like Bitcoin, and propose a valuation framework by examining supply and demand factors.

What is a smart contract platform?

"The big difference between Ethereum and Bitcoin is that Bitcoin is a platform where the value of the ecosystem comes from the value of the currency, but in Ethereum the value of the currency comes from the value of the ecosystem."

— Vitalik Buterin

While payment blockchains like Bitcoin excel at tracking token transfers between addresses, smart contract platforms like Ethereum also allow transactions to store, retrieve, and calculate upon arbitrary pieces of data. Smart contract platforms allow developers to write code called smart contracts to compute operations on-chain. In doing so, they allow developers to create decentralized applications (dApps) which can automate processes that have traditionally required human intermediaries. For example, instead of having to go through a weeks-long process at a traditional bank to take out a loan, smart contracts have allowed users to instantly deposit collateral and borrow assets in seconds without human intermediaries. The benefits from using smart contracts are broad: by frictionlessly interacting with neutral pieces of code rather than humans, many processes can become cheaper, faster, and transparent.

For the purposes of this piece, we will primarily focus on Ethereum as a case study, given that it is the most active smart contract platform in terms of users, transaction volume, total value transferred, and total projects built (Figure 1). For an overview of the smart contract platform landscape, click here to see our earlier report "Get Smart on Smart Contract Platforms".

Figure 1: Ethereum metrics

Source: Ethereum.org, as of January 2022

FUNDAMENTALS

A framework for valuing a smart contract platform could be similar to valuing commodities –a resource with consumptive use cases. As demand for the commodity's use cases grows, the price people are willing to pay generally increases with it. Similarly, given that many SCPs require the user to burn native tokens (referred to as "gas") in order to transact, the price of a native SCP token like ETH typically correlates with the utility of the network: as the number of transactions on a network increases, the number of tokens burned will also increase, resulting in less available supply and potentially higher valued tokens. As more useful decentralized applications (dApps) are deployed onto an SCP, demand for the native token to pay for transactions may grow.

SUPPLY/TOKENOMICS

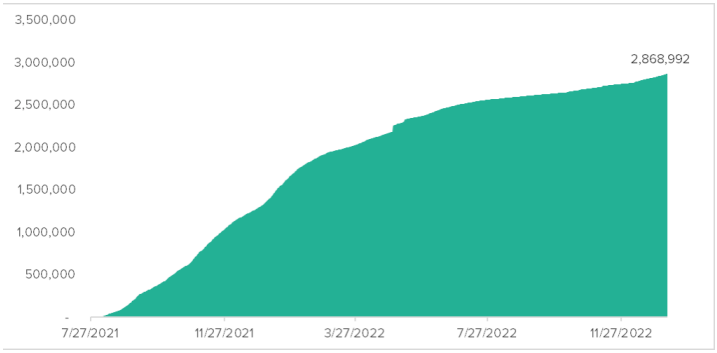
Similar to Bitcoin, Ethereum's supply mechanisms are preprogrammed. However, unlike Bitcoin, the supply mechanisms for Ethereum have gone through multiple changes. Let's walk through the two major milestones.

Major Milestones in Ethereum's Supply Dynamics

1. **August 2021 - Base Fee Burn Implemented:** When Ethereum was first created, ETH supply was distributed to miners in the form of 2 ETH per block, and 100% of transaction fees went to the miners.

   A fee burn mechanism was implemented when the London Upgrade was introduced, which included Ethereum Improvement Proposal[1] (EIP) 1559, leading the base transaction fees to be burnt instead of distributed to miners. Since more transaction fees were being burned than before, token inflation was reduced.

Figure 2: Total ETH burned since EIP-1559

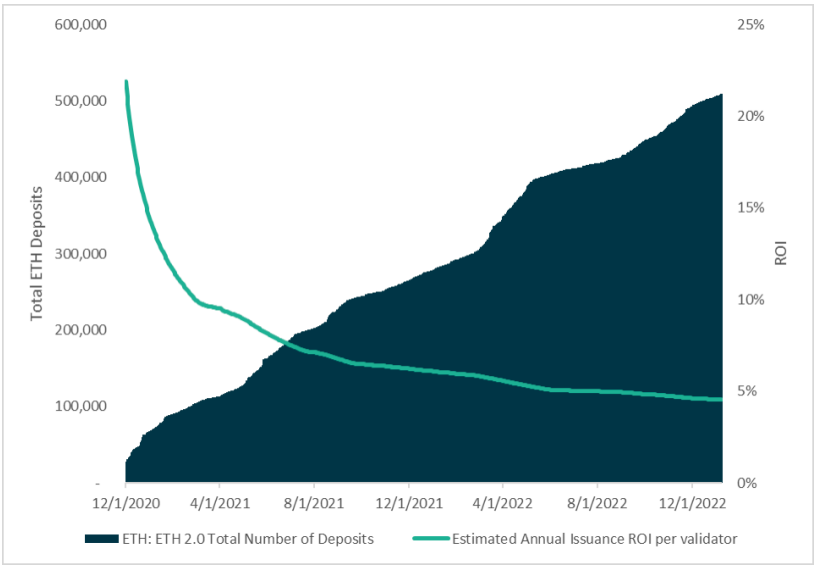


Source: Grayscale Research, Glassnode, from 8/5/2021 to 12/31/2022

2. **September 2022 - Merge + Removal of Miner Rewards:** After the Merge[2] miners no longer received block rewards. Instead, validators receive staking yield as reward for putting up their tokens to validate transactions. Unlike mining, which gives miners a fixed 2 ETH reward per block if they successfully mined the block, staking provides all stakers with a variable staking rate depending on the total amount of ETH staked across the ecosystem. A higher amount of ETH staked yields a lower annual percentage rate (APR) for each staker, and vice versa. As of December 2022, the annualized APR for an ETH staker is ~4% with ~15.9M ETH total staked.[3]

1. Ethereum Improvement Proposals describe standards for the Ethereum platform, including core protocol specifications, client APIs, and contract standards. Network upgrades are discussed separately in the Ethereum Project Management repository
2. The Merge refers to the original Ethereum Mainnet merging with a separate proof-of-stake blockchain called the Beacon Chain, now existing as one chain. The Merge reduced Ethereum's energy consumption by ~99.95%. Mining is no longer the means of producing valid blocks; instead, the proof-of-stake validators have adopted this role and are now responsible for processing the validity of all transactions and proposing blocks. For our report on the Merge, click here.
3. https://www.stakingrewards.com/earn/ethereum-2-0/

Figure 3: ETH Staking APR vs. Total ETH Staking Deposits



Source: Grayscale Research, Glassnode, from 12/1/2020 to 12/31/2022

Simple Supply Dynamic Change Model Walkthrough

Given these two events, an investor can form a model of how supply dynamics have changed (Figure 4 below):

1. **Framework**: First, create two columns: pre-merge and post-merge. This is to compare the token inflation pre-merge vs post-merge.

2. **Supply:** Create a supply section and break down token inflation by staking rewards and mining rewards.
   a. Staking rewards: Staking has been open since December 2020 and has yielded ~4%. Since there were around 15.9M ETH locked in the staking contract, annual staking rewards total to 15.9M ETH * 4%, or **~636K ETH annually**.
   b. Mining rewards: Mining rewards only existed pre-merge, and provided 2 ETH per block. Given that there were ~6,250 blocks per day on average, and that there are 365 days a year, 2 ETH/block * 6,250 blocks/day * 365 days/year = **~4.6M ETH annually**. Mining rewards disappear post merge.

3. **Demand**: This can be calculated by estimating the average amount of ETH burned per day. We can use 1,500 ETH/day as a base assumption[4]/ 1,500 ETH/day * 365 days per year = ~550K ETH burned per year.

4. 1,500 ETH burned per day derives from the 7 day rolling average ETH burn from ultrasound.money

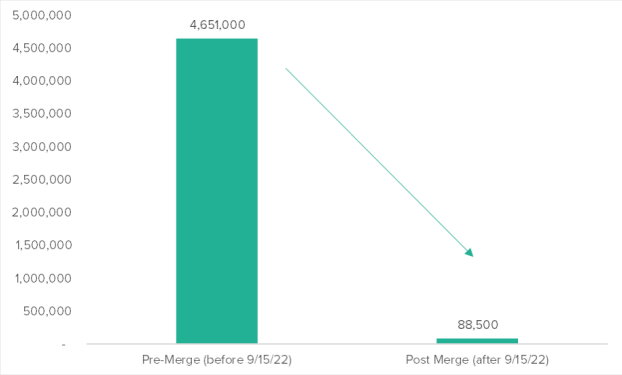
Figure 4: ETH Issuance Model

	Pre-Merge	Post Merge
Supply	Proof-of-Work	Proof-of-Stake
Staked ETH	15,900,000	15,900,000
x Current APR	4%	4%
Annual Staking Rewards	636,000	636,000
Blocks/day	6,250	-
x ETH reward/block	2	-
x Days/year	365	-
Annual Mining Rewards	4,562,500	-
Annual ETH Issuance	5,198,500	636,000
Demand		
ETH burned/day	1,500	1,500
Days/year	365	365
Annual Burned ETH	547,500	547,500
Net ETH Issuance (Issued - Burned)	4,651,000	88,500
Decrease in ETH Issuance	**98%**	

Source: Grayscale Research, ultrasound.money as of December 2022

By taking the previous proof-of-work[5] issuance and comparing it to the proof-of-stake[6] issuance, we can apply the model assumptions and see that total issuance has declined by more than **98% annualized.**

Figure 5: ETH annual issuance change



Source: Grayscale Research

For context, the change in ETH issuance is the equivalent to more than three BTC halvings all at once[7]. Assuming the Ethereum ecosystem grows in the future, ETH burn from a higher number of transaction fees could exceed issuance, potentially causing ETH to become a deflationary asset. Tracking upcoming changes in the Ethereum protocol and understanding the implications of those changes on total supply is critical for any prospective investor.

5. Proof of work is the original crypto consensus mechanism, first used by Bitcoin. Proof of work and mining are closely related ideas. The reason it's called "proof of work" is because the network requires a huge amount of processing power. Proof-of-work blockchains are secured and verified by virtual miners around the world racing to be the first to solve a math puzzle. The winner gets to update the blockchain with the latest verified transactions and is rewarded by the network with a predetermined amount of crypto.
6. Proof-of-stake is a consensus mechanism where validators explicitly stake capital in the native token (ie ETH into a smart contract on Ethereum). This staked token then acts as collateral that can be destroyed if the validator behaves dishonestly or lazily. Validators receive a percentage of their stake as a reward for their services.
7. A bitcoin halving is when mining rewards get cut in half based on the preprogrammed schedule written in the bitcoin codebase. 3 halvings would be the equivalent of 0.5^3, or 12.5% of the previous issuance rate, or an 87.5% issuance decrease.

Unlike most payment crypto assets like bitcoin, which haven't seen major changes in supply dynamics, SCPs seem to make more major changes to their codebase as a result of working on a more complex infrastructure. As a result, certain structural dynamics like supply can occasionally change drastically. As an investor, understanding the second-order effects of a large change in supply dynamics is important. For example, after a drastic decrease to token inflation (e.g. post EIP-1559 and the merge), imagine a scenario where one believes that the intrinsic value of Ethereum is relatively constant. Given that annual sell pressure of ~4.5M ETH from miners is reduced to zero (since miners don't receive block rewards anymore) and assuming market price stays relatively constant in the short term, one could ask questions like:

- "*Without 4.5M ETH sell pressure a year, what would happen to price if buying pressure stayed the same?*"
- "*What happens to price if demand is constant but ETH becomes deflationary?*"

If the investor believes that the market hasn't priced in the full implications of a lower token inflation rate, they could buy the asset if they believe the implications are bullish.

While the previous two changes (EIP-1559 and the Merge) represent the most explicit changes to supply and demand dynamics, these aren't comprehensive. Other changes that could impact these dynamics include:

1. **Changes to the monetary policy**: If the Ethereum network were to change the way it creates new ETH, this could potentially impact the supply of ETH and thus its price. For example, if the rate at which new ETH is created were to decrease, this could lead to an increase in demand for ETH as the supply becomes more scarce.

2. **Changes to the use cases**: If the Ethereum codebase were to be modified in a way that expands the range of applications that can be built on the platform, this could increase the demand for ETH as more people and organizations look to use the Ethereum network.

3. **Changes to the scalability of the network**: If the Ethereum codebase were to be modified in a way that improves the scalability of the network, this could potentially increase the demand for ETH as more people and organizations are able to use the Ethereum network for their decentralized applications.

Token Allocations

Native token allocations and unlock periods should also be considered when understanding supply dynamics. For most SCPs, the founding team typically allocates a portion of tokens to themselves and other insiders to fund the project initially. These tokens are typically vested over a number of years but vary significantly based on team. If one wants to buy a certain token due to a long term view, entering a token position after a vesting period (when there may be higher sell pressure from the founding team) could prove to be a beneficial entry point for an investor. The table below provides an overview of private token allocations and tokenomics of various SCPs.

Figure 6: High Level Tokenomics of various SCPs

TOKENOMICS OF THE LEADING SMART CONTRACT BLOCKCHAINS
Source: Global X ETFs with information derived from various public sources, as of July 1, 2022

	Ethereum	BNB Chain	Cardano	Solana	Avalanche
Yearly Issuance Rate	4.5% (0.5% PoS-chain) *	0%	3.85%	5.6%	5.3%
Coin Burning Mechanism	~50% of transaction fees	~10% of transaction fees	No	~50% of transaction fees	~100% of transaction fees
Yearly Inflation **	3.7% (-0.3% PoS chain) ***	-4.5%	3.85%	4.72%	5.1%
Staking Rewards for Delegators	4.12%	5.35%	4.96%	4.93%	8.69%
Staking Rewards (Inflation) ****	0.42%	9.85%	1.11%	0.21%	3.59%
Private Token Allocation	15% insiders 5% foundation	50% insiders	17% insiders 2% foundation	48% insiders 13% foundation	42% insiders 19% foundation

Source: Global X ETFs

DEMAND

Quantitative Metrics

We used 1,500 ETH burned per day as a proxy for demand in our issuance model above, but what are some underlying factors of that demand? Below we examine a number of quantitative metrics that one can use to determine demand:

Metric	Description	Interpretation	Resources
Number of active addresses	The number of unique addresses that are actively participating in the Ethereum network	Can be a useful indicator of the level of adoption and engagement with the network	BitInfoCharts
Developer Activity	A measure of the level of activity and engagement among developers building on the Ethereum network	Indicates activity level and usage of decentralized finance (DeFi) applications on the platform	Electric Capital Developer Reports CryptoMiso
Total Value Locked	A measure of the total value of assets locked up in smart contracts on the Ethereum network	Indicates activity level and usage of decentralized finance (DeFi) applications on the platform	DeFiLlama
Protocol Specific Transactions	A measure of various transactions that are unique to a protocol	Typically, higher transaction activity indicates greater usage and adoption of the protocol	Dune Analytics
Network Fees	A measure of the average fees being paid to conduct transactions on the Ethereum network.	Shows the level of demand for the network.	Ultrasound money
Adjusted Trade Volume	Market metric that shows the amount of cryptocurrency transacted on exchanges	Similar to looking at the trading volumes of a currency, a rising trend indicates a more liquid market, which allows larger players to participate in size. Adjusting the trading volume by only counting the volumes from regulated and reliable exchanges may provide a more accurate number	CoinMarketCap CoinGecko Messari
Funding Rates and Open Interest	Funding rates indicate whether there are more long or short positions on perpetual futures contracts Open interest indicates the total amount of open positions currently on a derivative exchange pair, like ETH/USD	These derivatives-based metrics indicate where traders predict future asset prices will stand. Positive funding rates on perpetual futures indicate that more traders are long, and the inverse also applies. A larger open interest value could indicate increased volatility in the price of a crypto-asset	Coinglass

Some qualitative metrics to monitor include:

1. **Development roadmap:** The development roadmap of a blockchain network can provide insight into the long-term vision and direction of the project. One needs to understand the development priorities and goals of the Ethereum network and how they may impact the network over time.

2. **Community engagement:** The strength and engagement of a blockchain network's community can be an indicator of its health and long-term prospects.

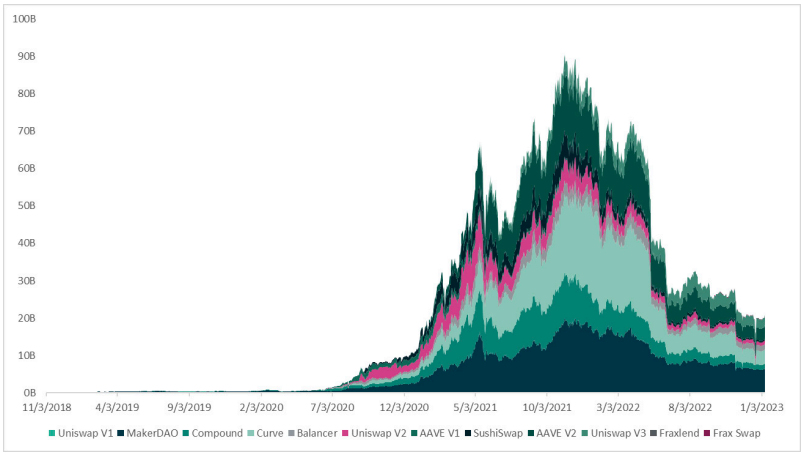
3. **Regulatory environment:** The regulatory environment in which a blockchain network operates can have a significant impact on its development and adoption. It is important to understand the regulatory landscape surrounding Ethereum and how it may impact the network in the future.

4. **Institutional adoption:** Announcements that large or incumbent financial institutions are planning to offer certain services could be beneficial to prices in the long-term, since these platforms boast a significant number of users who may be incremental net buyers.

Use Cases

Because Ethereum's value is correlated to dApp usage, it's useful to understand which use cases have found a niche amongst the user ecosystem. Understanding the range of applications that have been successful on Ethereum can help us ascertain where demand may grow given stronger adoption in the future.

Figure 7: Total Value Locked (in dollars) of Notable Ethereum DeFi dApps



Source: Grayscale Research, DefiLlama

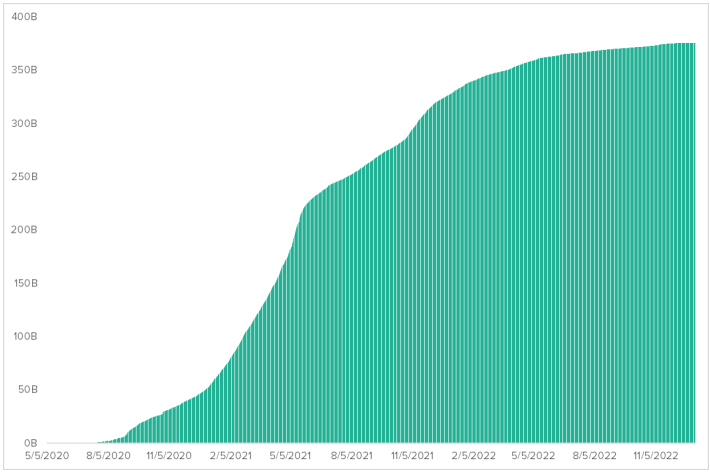
Decentralized Exchanges/Automated Market Makers (DEXs)

Imagine that Alice and Bob want to trade some digital assets, but they don't want to use a traditional exchange, and would prefer to avoid risks that may come alongside centralized entities. Instead, they decide to use a Decentralized Exchange (DEX), which is a platform that allows them to trade assets with each other without the need for a centralized exchange. There are a few advantages that DEXs have over traditional exchanges:

- **Decentralization**: Since DEXs are essentially deployed smart contracts, there is less centralization risk since anyone can interact with those smart contracts. As a result, this makes them more resistant to censorship or reliance on a single party.
- **Privacy**: DEXs offer somewhat higher privacy than centralized exchanges since they don't require users to provide customer-identifying data.
- **Accessibility**: Because there isn't a lengthy onboarding process, most users can start trading on the platform with just an internet connection. This makes these services available to the 1.4bn of unbanked individuals globally.

Given that this is a technology that allows permissionless asset trading, popularity has grown significantly as shown in Figure 8 below.

Figure 8: Uniswap[8] Cumulative $ Volume



Source: Grayscale Research, Glassnode, as of 12/31/2022

While DEXs are still in their infancy, and still lack in both capabilities and user experience compared to centralized exchanges, Uniswap's DEX aggregate volume on Ethereum reached over $350bn in May 2022, indicating that there is product market fit. As DEXs continue to grow, we can expect them to take more market share away from centralized exchanges as they gradually improve.

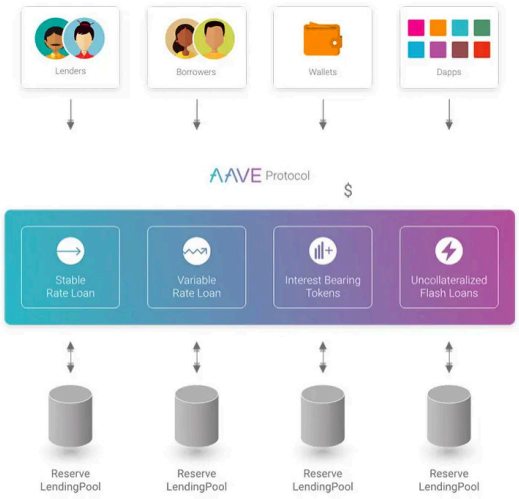
8. Uniswap trading volume provided by Glassnode. It does not contain all Uniswap trading volume, only the smart contracts on Ethereum's mainchain.

Borrowing/Lending Protocols

Imagine a scenario where Alice wants to borrow token XYZ from Bob without selling her ETH. Alice sends some ETH (Ethereum's native cryptocurrency) to the protocol as collateral, which is a security deposit that Bob can use to cover any losses if Alice doesn't pay back the loan. Bob agrees to lend Alice the XYZ tokens, and the borrowing and lending protocol uses a smart contract to handle the terms of the loan and the repayment schedule. The smart contract automatically tracks the loan, including how much Alice owes, the interest rate, and the repayment schedule. As Alice pays back the loan, the smart contract automatically releases the collateral back to her. Once the loan is fully repaid, the smart contract marks the loan as complete and the process is finished.

In Figure 9 below, protocols like Aave use smart contracts to provide users with various financial instruments, including stable-rate loans, variable rate loans, and interest-bearing loans. Through smart contracts, borrowing and lending protocols like Aave provide users with an automated way to access various financial services that only traditional banks used to provide, as well as access to new innovations like flash loans, which don't exist yet in traditional finance.

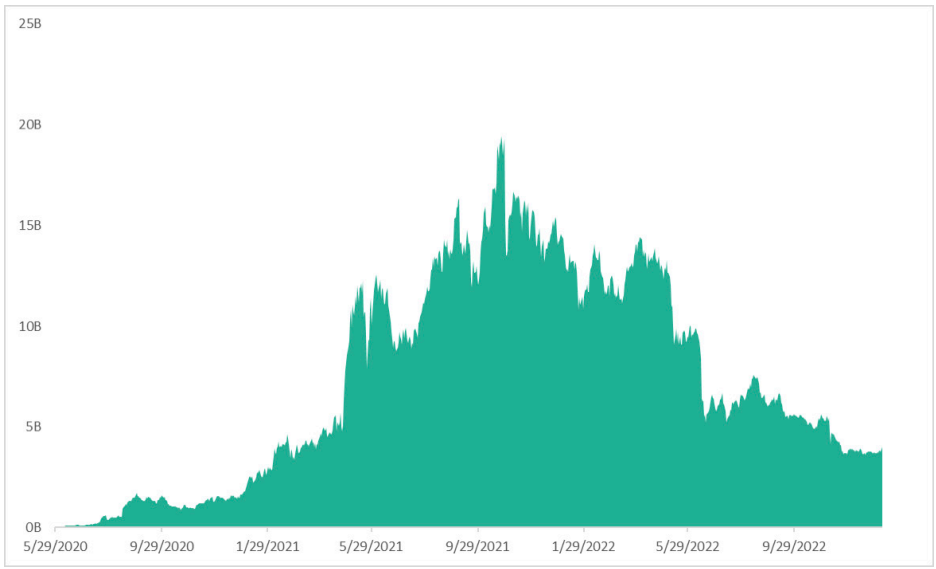
Figure 9: Aave (Borrowing/lending protocol)



Source: Aave Documentation

Like DEXs, borrowing/lending protocols have also seen a rise in popularity, with billions of dollars worth of tokens deposited in the past two years using Aave as a proxy:

Figure 10: Aave Total Value Locked in $



Source: Grayscale Research, DefiLlama

Borrowing/lending protocols also provide advantages including decentralization, privacy, and accessibility. In addition other advantages a borrowing and lending protocol have over a traditional lender include:

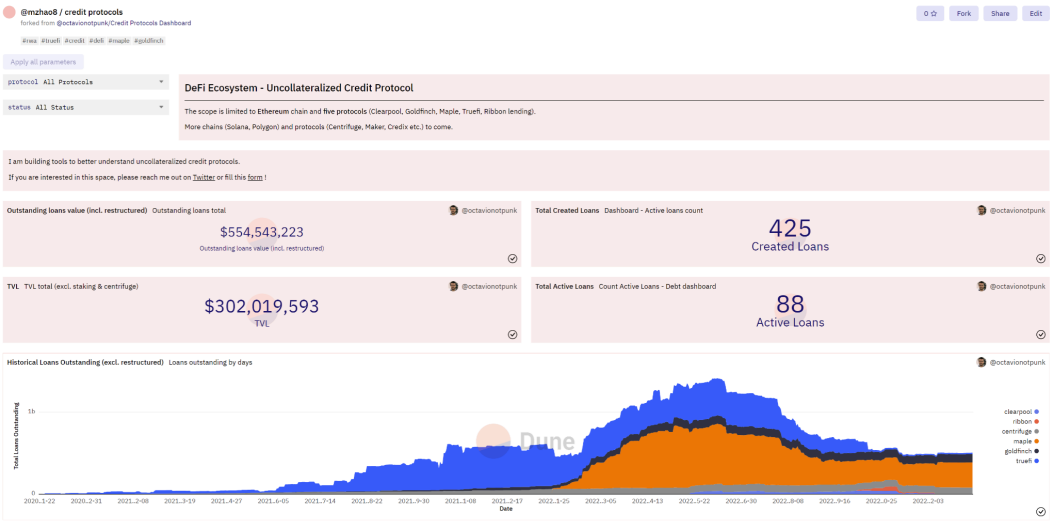
- **Speed**: Loans are instantly collateralized, so users can borrow immediately without delays, unlike dealing with traditional lenders.
- **Automatic enforcement**: Repayment schedules, interest payments, and liquidations are all handled automatically by the protocol smart contracts.
- **Yield**: Lending out crypto assets for interest allows users to earn yield from borrow demand.
- **Transparency**: Loan liquidation prices, collateral amounts, borrow rates, and interest rates are completely transparent to the user, allowing anyone to verify balances on-chain.

There are also risks. One such example is the need for assets to be vetted for liquidity before being allowed to become collateral. Allowing thinly traded assets as collateral can be detrimental to borrower assets.

General dApp Research

Various dApps have various purposes; there's no one-size-fits-all approach towards measuring demand when researching a project. However, using free data resources like Dune Analytics can help an investor focus on specific metrics unique to a dApp sector. For example, if someone wanted to look at the size of the total uncollateralized credit protocol market on Ethereum, they could search up "uncollateralized credit protocol" on Dune.com and find various dashboards that track various uncollateralized credit protocol metrics, like total loans created, active loans, etc.

Figure 11: Dune Dashboard screenshot



Source: Grayscale Research, @octavionotpunk on dune.com

If an investor wants to figure out if underlying demand is sticky[9] for an SCP token, using a tool like Dune would allow the user to plot various types of charts to gauge usage for a variety of protocols. Assuming that, in aggregate, the data reveals high consumer dApp stickiness and usage, it could serve as one factor in favor of a long-term investment in the SCP token.

9. Demand stickiness is the resistance of a good or service's demand to change quickly, despite shifts in the broad economy. "Sticky" is a general economics term that can apply to any financial variable that is resistant to change.

COMPETITIVE LANDSCAPE

While Ethereum comprises the bulk of both market capitalization and total value locked, there are other smart contract platforms that directly compete with Ethereum, including:

- **Solana** is a smart contract platform that is designed for speed and low transaction fees. The Solana foundation claims to have the ability to process 65,000 transactions per second, faster than many other smart contract platforms.
- **Avalanche** is marketed as a blockchain focused on decentralized finance and gaming. Avalanche claims to be able to process thousands of transactions per second, and also is fully compatible with Ethereum. Developers can easily port applications from Ethereum onto Avalanche. The Avalanche blockchain architecture includes subnets, which are separate independent networks that can run different types of DApps. Each subnet is self-contained and has its own set of validators, consensus rules, and governance structures, and can leverage the security and decentralized nature of the main network.
- **Polygon** leverages sidechain architecture compatible with Ethereum's mainchain. Given compatibility with Ethereum, it's easier for Ethereum developers to port their DApps onto Polygon, which has allowed the Polygon ecosystem to grow quickly. In addition, the Polygon network allows for faster transaction speeds and lower transaction fees compared to Ethereum.

Figure 12: Activity of Leading Smart Contract Blockchains

ACTIVITY OF THE LEADING SMART CONTRACT BLOCKCHAINS BY MARKETCAP*
Source: Global X ETFs with information derived from various public sources, as of July 1, 2022

	Ethereum	BNB Chain	Cardano	Solana	Avalanche
Unique Active Addresses	413,000	950,000	68,000	1,000,000	41,000
Daily Transaction Count	1,000,000	4,000,000	69,000	34,000,000	235,000
Dapps	Over 3,000	Over 3,000	Over 100	Over 500	191
Active Developers	Over 4,000	Over 80	Over 100	Over 800	Over 50

Source: Global X ETFs

INVESTOR CHECKLIST

When comparing smart contract platforms, here is a potential general checklist for the evaluation process:

General Information

1. **Market demand and adoption**: A platform with strong market demand and adoption is likely to be more attractive to investors, as it indicates that there is a strong user base and developer community using the platform.
2. **Performance and scalability**: One may want to consider the performance and scalability of the platform, as this can affect the user experience and the ability of the platform to handle a large number of transactions and users.
3. **Security**: Security should be considered for any smart contract platform, as vulnerabilities or hacks can have significant consequences for users and investors.
4. **Regulatory environment**: It is important to understand the regulatory environment in which the platform operates, as this can impact the legal and compliance risks associated with the platform.
5. **Team and governance**: The team and governance structure of the platform can also be factors to consider, as the leadership and decision-making process of the platform can impact its direction and success.
6. **Ecosystem and partnerships**: The strength of the platform's ecosystem and partnerships with other companies and organizations can also be a key factor in its success.

Economic Model

1. **Token issuance and distribution**: How is the token issued and distributed? Is it pre-mined, or is it mined through a proof-of-work or proof-of-stake mechanism? How is the token distributed to early supporters and developers, and how is it made available to the broader market?
2. **Token use cases**: What is the primary use case for the token? Is it used to pay for transactions, or is it used as a governance token to allow holders to vote on platform decisions? Is the token used to incentivize certain behavior, such as staking or contributing to the network?
3. **Token supply**: What is the total supply of the token, and how is it expected to change over time? Is there a maximum supply, or will the token have an infinite supply?
4. **Token demand and adoption**: What is the current demand for the token, and what are the factors that are driving this demand? Is the token widely adopted and used within the platform's ecosystem, or is it primarily held by speculators?

CONCLUSION

The supply and demand dynamics of smart contract platforms are driven by a range of factors, including market demand and adoption, performance and scalability, security, regulatory environment, team and governance, and ecosystem and partnerships.

On the supply side, understanding both the economic models and potential upgrades can provide context into large structural shifts, e.g. analyzing the supply dynamics of Ethereum after EIP-1559 and the merge. On the demand side, paying attention to fundamental indicators like dApp product market fit through sources like Defi Llama and Dune Analytics can provide an investor with what specifically is driving usage.

Understanding these factors and how they interact with each other is crucial for investors looking to evaluate the investment potential of different platforms. In the case of Ethereum, the declining supply schedule combined with the growth in dApp adoption suggests that the token may be undervalued as a result of broader macro-driven selloffs. As the market for smart contract platforms continues to evolve, it will be important for investors to stay informed about the latest developments and trends in order to make informed investment decisions.

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