Fidelity DIGITAL ASSETS℠

AUGUST 2023

Ethereum Investment Thesis

Ethereum's Potential as Digital Money and a Yield-Bearing Asset

Fidelity Digital Assets℠ Research

Introduction

While users may get technological utility from the Ethereum network by accessing the various applications in the ecosystem, some may wonder, "how does utility translate into value for ether the token?" In other words, why would an investor buy and hold ether, rather than just use it to interact with the Ethereum network? In our previous paper introducing the Ethereum network, About Ethereum, we only briefly considered how or why the ether token may accrue value. In this paper, we examine this question more deeply on an investment thesis level and include some of the technical aspects related to the various investment theses.

The following observations are discussed:

- Ethereum may be best understood as a technology platform that uses ether (ETH) as a means of payment.
- Ethereum's perceived value is tied to network usage and supply and demand dynamics, which have changed since The Merge.
- Ether's overall platform usage may pass value on to token holders, whereby increased usage of the Ethereum network and platform leads to value accrual to ether.
- One investment thesis for holding ether is as an emerging form of money, similar to bitcoin.
- However, it seems unlikely that any other digital asset could improve upon bitcoin as a monetary good because of its characteristics and network effects.
- That said, value is subjective and it does not mean that other competing forms of money, such as ether, can not exist, especially for specific markets, use cases, and communities.
- We examine ether's ability to fulfill two of the primary functions of money: store of value and means of payment.
- Ethereum is not complete, so yearly upgrades are expected, introducing recurring technical risks and unknowns that degrade its prospects as a store of value asset.
- While ether is used for various payment use cases, fee volatility remains a barrier to wide-scale adoption.
- We examine a demand-side model for ether, but find there is less of a relationship between address growth (measure of adoption) and price of ether compared with bitcoin.
- Ethereum's switch to proof-of-stake now lets token holders receive yield, some of which is driven by increased network usage; we examine where this yield comes from and what the various drivers and risks are.
- As a yield-generating asset, ether's value can be examined through a discounted cash flow model; we construct a simple model to illustrate the assumptions that can drive the model.

Ethereum vs. Ether

Digital asset networks and their native token have a relationship, but success between the two is not always perfectly correlated. In some cases, networks can provide utility to users and settle a considerable number of complex transactions on a daily basis without accruing much value for their native token holders. Other networks may have a stronger linkage between network usage and token value. One common term used to describe the relationship between network design and token value is "tokenomics." Tokenomics, short for "token economics," helps explain how a network or application's design could create economic value for token holders.

Ethereum's network has undergone significant changes over the past few years, which have affected the network's tokenomics. The introduction of burning a portion of transaction fees, known as the base fee, was implemented in August 2021 with Ethereum Improvement Proposal 1559, or EIP-1559. Burning ether is equivalent to destroying it; therefore, transaction execution on Ethereum takes ether out of circulation.

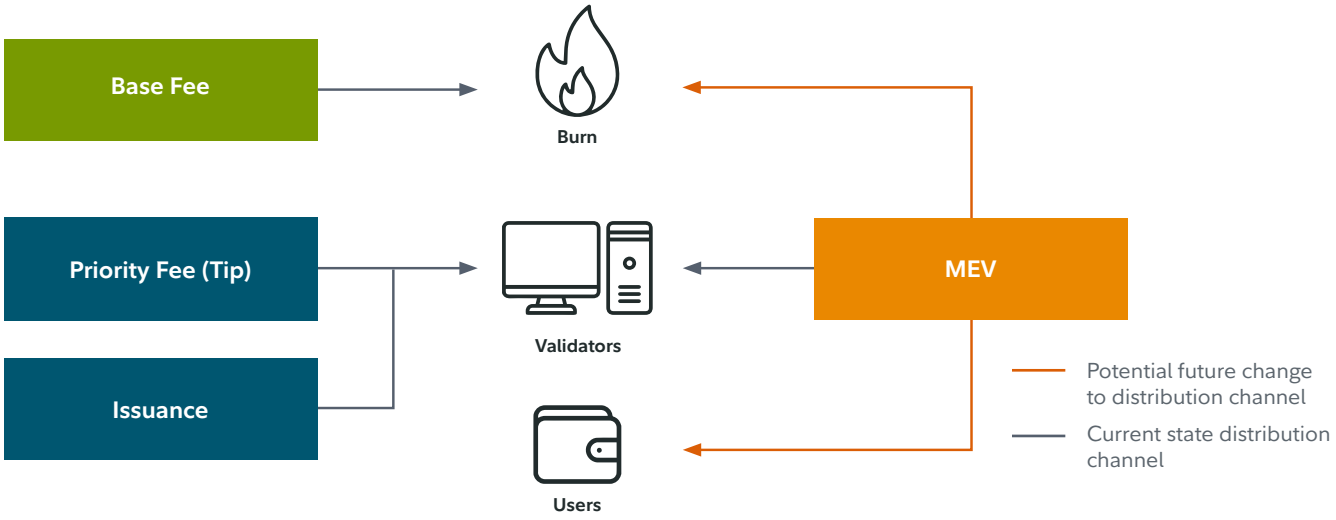
Additionally, the transition from proof-of-work to proof-of-stake in September 2022 has lowered the network's token issuance rate and enabled staking, which allows entities to receive yield in the form of tips, issuance, and maximal extractable value (MEV). Ethereum's previous upgrades have fundamentally altered ether's tokenomics and changed how one may consider the relationship between Ethereum and ether.

Tokenomics: How Ether Accrues Value

Ether's tokenomics consists of three functions where usage translates to value. When transacting on Ethereum, all users pay a base fee and a priority fee (tip), and may generate additional value for other parties via MEV, the maximum amount of value a validator can receive by including, excluding, or changing the order of transactions during the block production process, from their transaction. The base fee, paid in ether, gets burned upon inclusion in a block (bundle of transactions), reducing the outstanding supply of ether by the amount burned. The priority fee, or tip, is given to the validator, an individual or entity responsible for updating the public ledger and maintaining consensus. When proposing blocks, data structures that store new and all previous transaction data, validators are incentivized to include transactions with the highest priority fee because this is potentially their primary direct form of payment. Lastly, the potential MEV opportunity (usually arbitrage) gets submitted by a different user and passes most of this value to the validator through competitive MEV markets in the current state.

The value accrual mechanisms described can be viewed as network "revenue" being spent for different reasons. First, the base fee being burned is a deflationary pressure on the total supply that benefits existing

token holders. Second, the priority fee and MEV come from the user and are distributed to validators for their services. While the relationships are nonlinear, increased platform use equates to increased burn and increased yield for validators.

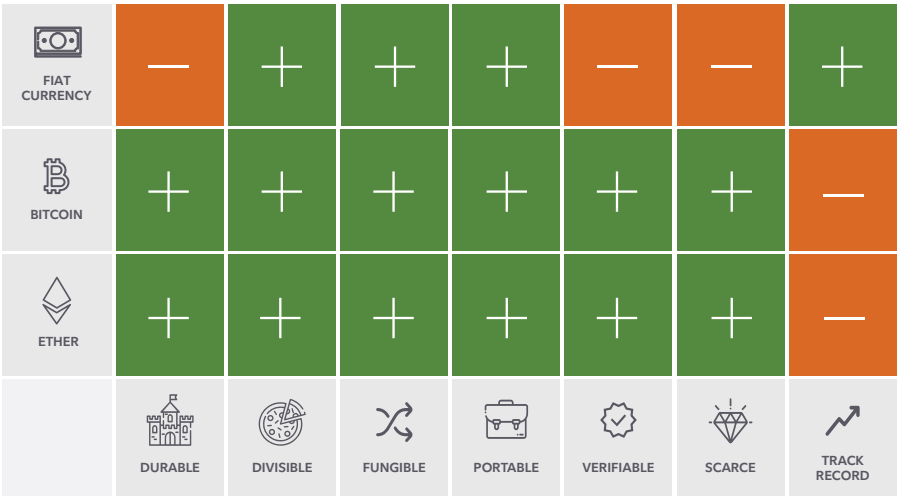


Source: Fidelity Digital Assets, as of 05/10/2023.

Investment Thesis 1: Aspiring Money

A common narrative theorizes that bitcoin is best understood as an emerging monetary good, which leads to the question of whether ether can be considered money as well. The short answer is yes, it could be viewed that way by some; however, ether will likely face significantly more headwinds than bitcoin to become widely accepted as a form of money. As shown below, ether shares many properties of money with bitcoin and other currencies; however, it differs from bitcoin in scarcity and track record. Ether technically has unlimited supply parameters, which are kept within a range depending on the number of validators and burn. These parameters, while strictly enforced by the network, are not equivalent to that of a fixed supply schedule and can swing in unexpected directions depending on the underlying components. A digital asset's track record not only has to do with time since inception, but also time since ossification. Since Ethereum undergoes network upgrades roughly once every year, this new code needs time and, more importantly, developer eyes to rebuild its performance history. While this concept of code execution being probabilistically guaranteed over time is specific to digital assets, it is undoubtedly important for garnering stakeholders' trust.

It seems unlikely that any other digital asset could improve upon bitcoin as a monetary good because bitcoin is viewed by some as the most secure, decentralized, sound digital money to this point, and any "improvement" would require trade-offs. While network effects are paramount in the blockchain ecosystem,



with bitcoin being the best positioned in this regard as a monetary good, it does not mean that other competing forms of money can not exist, especially for different markets, use cases, and communities. More specifically, Ethereum's alternative uses, which do not exist on Bitcoin, such as facilitating more complex transactions, give it a unique, money-like utility that should be considered. While ether is commonly transferred between addresses to send value similarly to bitcoin, ether's additional role as the currency by which users execute smart contract logic is its true differentiating factor.

Transactions for everyday goods are not yet taking place on Ethereum in any notable way, but the physical and digital worlds appear to be converging. As we have seen from leading technology companies, an application that provides distinct services to users has driven network effects and demand. Mainstream applications being used on top of Ethereum would, by default, lead to demand for ether, which is why this longer-term trend could be one of the most compelling cases for ether as an aspiring alternative money.

In fact, there are already some notable Ethereum integrations in the physical world and traditional finance sector:

- MakerDAO (a project built on the Ethereum blockchain) purchased $500 million in Treasuries and bonds.[1]
- The first U.S. house sold on Ethereum was done as a non-fungible token (NFT).[2]
- European Investment Bank issued bonds on-chain (directly on the blockchain).[3]
- Franklin Templeton's money market fund uses Ethereum via Polygon to process transactions and record share ownership.[4]

The convergence of the Ethereum ecosystem and real-world assets has commenced. However, years of improvement, regulatory clarity, education, and trial by time may be necessary before the masses start transacting on Ethereum or competitive platforms. Therefore, ether could remain a niche form of money until then.

1 https://www.bloomberg.com/news/articles/2022-10-06/defi-protocol-makerdao-puts-500-million-in-treasuries-corporates

2 https://www.coindesk.com/business/2022/02/11/nft-linked-house-sells-for-650k-in-propys-first-us-sale/

3 https://www.eib.org/en/press/all/2021-141-european-investment-bank-eib-issues-its-first-ever-digital-bond-on-a-public-blockchain

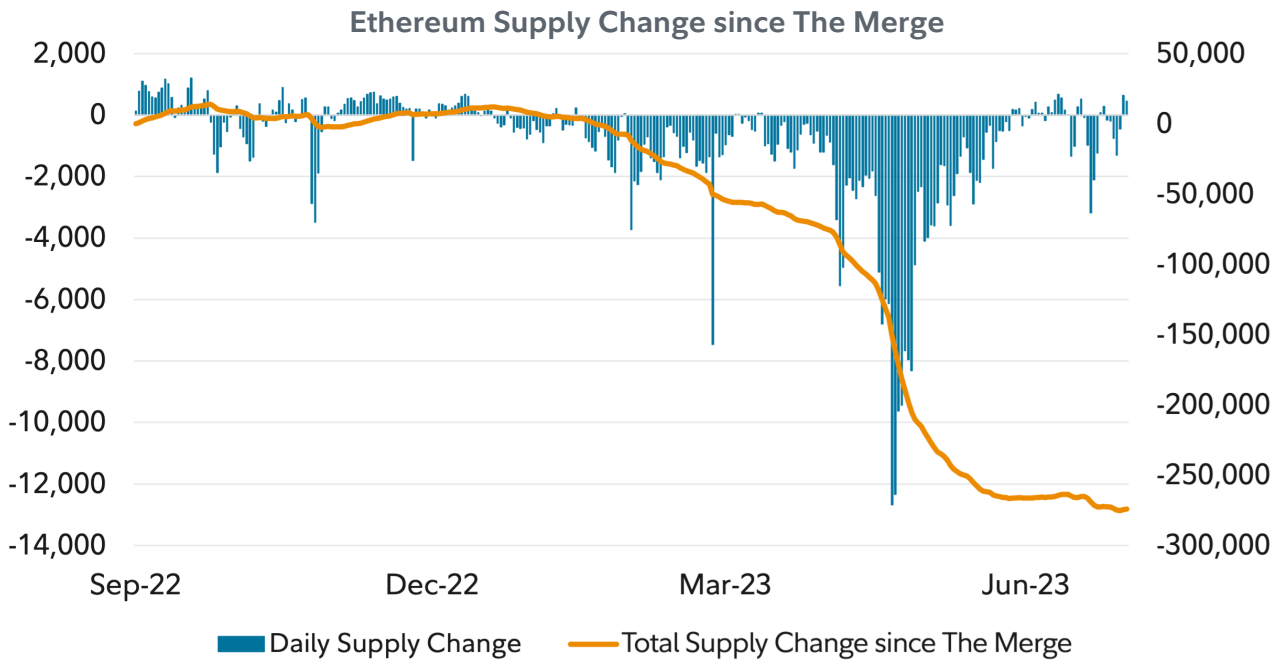
4 https://www.franklintempleton.com/press-releases/news-room/2023/franklin-templeton-money-market-fund-launches-on-polygon-blockchain

Among these hurdles, regulation is the most polarizing topic in terms of how Ethereum's future may be shaped. Although it is a global permissionless blockchain, many of the largest centralized exchanges that hold and stake ether reside in the U.S., meaning any guidelines provided to validators or investors in this jurisdiction could greatly affect valuations and network health. With multiple instances of regulatory enforcement actions and the shutdown of crypto-related banks and Kraken's staking services in the U.S. recently, regulatory risk is one of the most serious obstacles Ethereum may face in the near-term.

We explore ether in the two main functions of money below:

Ether as a Store of Value

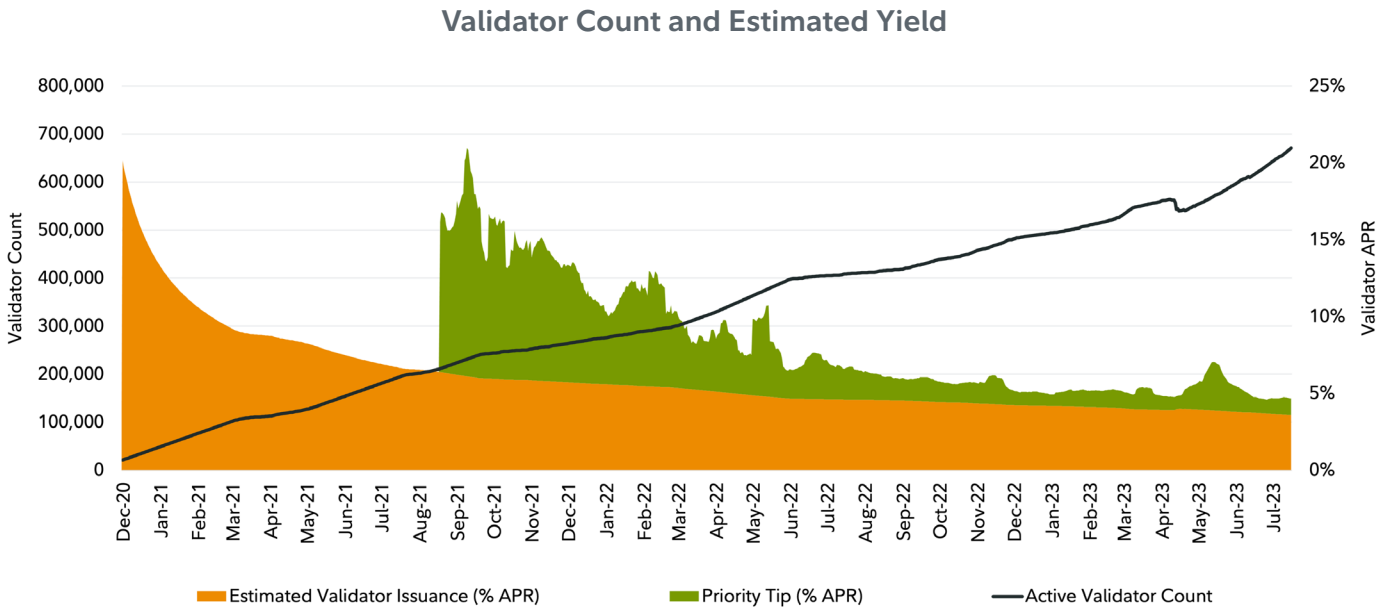
For something to be a good store of value, it needs to be scarce or have a high stock-to-flow ratio. Ether has a stock-to-flow ratio that is higher than bitcoin as of July 2023. This dynamic has recently taken center stage since The Merge, significantly reducing the amount of ether being issued as shown below.



Source: Coin Metrics, 07/16/2023.

We have written at length that one of bitcoin's core value propositions is its maximum fixed supply of 21 million bitcoin, with a supply schedule that has not and is not likely to change. Bitcoin's supply schedule is programmed into its code and enforced through social consensus and incentives of the network participants. But what underpins ether's scarcity and supply schedule? As can be seen above, ether's issuance is less of a schedule and more of a balance between set parameters. In fact, there are two variables that determine the total supply of ether, which make assessing future supply difficult:

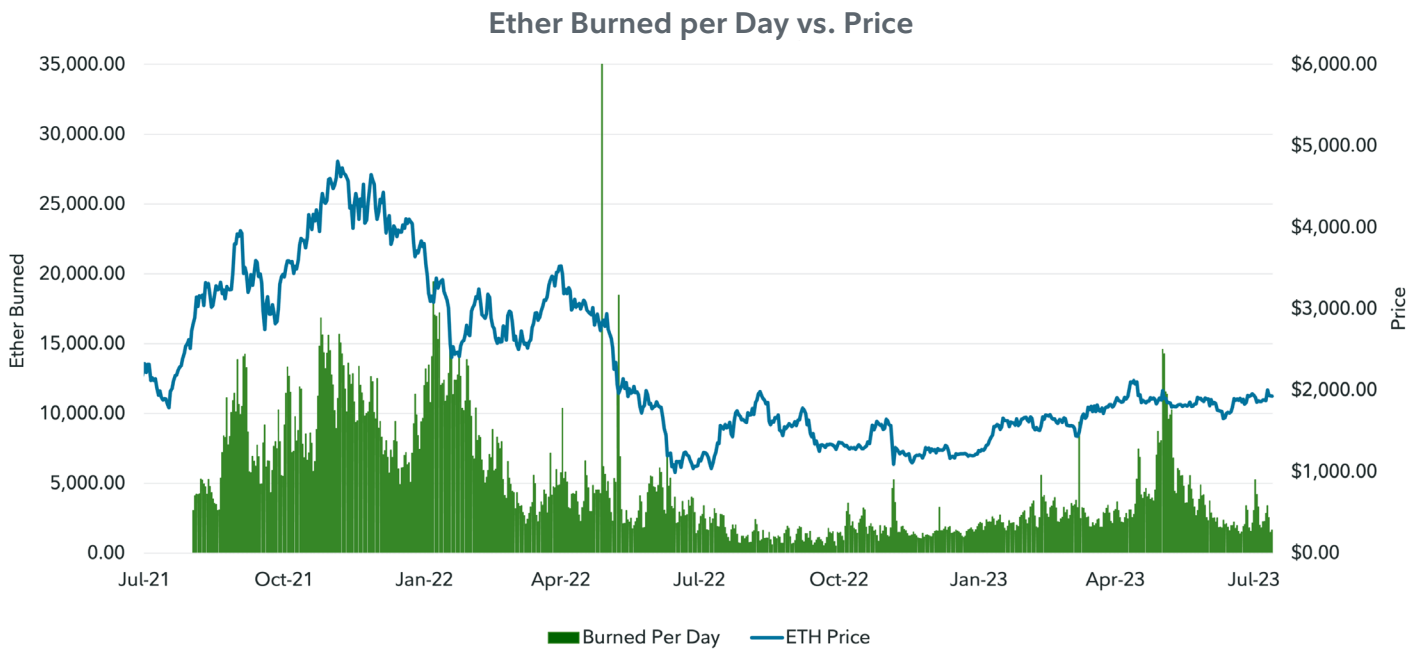
1. **Issuance:** Issuance is determined by the number of active validators and their performance. The important trend from this model is that as the total number of staked ether increases, so does the total ether issuance—but at a decreasing rate. Because ether issuance is tied to the amount of stake, this component of the formula is not prone to wild swings. The Ethereum protocol has set limits on how many validators can enter and exit staking, designed so that the security backing the protocol and, therefore, issuance rates, remain stable over time.



Source: Coin Metrics, 07/16/2023.

2. **Burn:** Burn is determined by demand for block space, with block space being a limited amount of computational work that can be done every 12 seconds. Burn is wildly volatile, which makes ether's exact future supply impossible to predict. Burn acts as an incentive pendulum and is rarely the same from block to block. The protocol has a target amount of gas (fees paid in ether) that each block should contain. If one block's amount of gas is above or below the target, it causes the next block's base fees to adjust accordingly. This adjustment is nonlinear and can cause dramatic spikes in transaction fees when on-chain activity is high. It also acts as a security mechanism designed to make it uneconomical for bad actors to spam the network indefinitely.[5]

5 https://ethereum.org/en/developers/docs/gas/



Source: Coin Metrics, 07/16/2023.

Ultimately, ether's supply is not based on a fixed schedule. Both components of ether's monetary policy are likely to remain in flux; however, the current structure ensures that, at most, ether's total supply inflates about 1.5% per year. This assumes that 100% of the current supply is staked with zero burn, which means that there are zero transactions occurring on Ethereum. As shown in the chart above, keeping ether issuance or inflation low does not require elevated levels of burn to occur. In fact, increased burn usually leads to net deflation or a decline in the supply of total ether outstanding.

It has been proposed that ether's future supply is tied to the number of active validators (issuance) and demand for transaction execution (burn), with the latter being relatively unpredictable over the longer-term. Adding to the uncertainty around supply dynamics, upgrades to Ethereum may directly impact how much burn or issuance occurs on the base layer, which further prevents current metrics from meaningfully informing of potential future outcomes. For instance, the Shanghai/Capella upgrade lessened staking-related risks and may prove to increase overall issuance due to higher staking participation. On the other hand, data availability scaling (upgrades focused on increasing transaction throughput) and the maturation of layer 2 platforms, separate blockchains built on top of Ethereum, are likely to shift the supply and demand dynamics of burn in unpredictable ways and further muddy the waters of ether's future supply.

Moreover, competing layer 1 networks, which are separate blockchains with a native token responsible for finalizing transactions, have not had the opportunity to benefit from the same amount of time and iteration as Ethereum. As dApps (decentralized applications) move and integrate with other blockchains, investors should be aware of where that may drive users. For certain use cases, such as NFTs or gaming, users may not need the decentralization and security that the Ethereum base layer offers. Should users be willing to

sacrifice these components of the blockchain trilemma for layer 1s that have prioritized scalability, some of this user-driven value will likely accrue outside of Ethereum. Since the smart-contract platform economy may be multichain anyway, investors should consider determining what use cases they believe Ethereum will retain for the long term and which will live elsewhere.

The last and most critical component that makes ether largely different from other store of value assets is the likelihood of future upgrades to the supply schedule itself. In the latest release, developers have noted an "Endgame EIP-1559" and "MEV Burn."[6] These roadmap components clearly denote that a change to how burn affects supply is coming, yet it is uncertain what these changes will be. Since EIP-1559 was launched, there could be significant impacts based on how the community decides to adjust EIP-1559's current design and whether MEV will be burned instead of being rewarded to validators or others. Whatever these changes result in, it stands in stark contrast to Bitcoin's value proposition, which claims its fixed supply schedule will not be changed long into the future.

In summary, although Ethereum's narrative around ultrasound money has picked up steam among community members, many obstacles remain before ether's supply is proven to be reliably consistent to that of other store of value assets. Ether's overall platform usage can pass value to token holders. However, value is subjective and any characterization of the asset may merely be semantics, especially being so early in its lifecycle.

Ether as a Means of Payment

Ether is used as a means of payment, but these payments have been limited to digitally native assets. Ethereum typically reaches finality in 13 minutes for most transactions, making it faster to become a "guaranteed" settlement than Bitcoin's six-block (one hour) probabilistically guaranteed settlement. Finality in Ethereum means that a transaction has been included in a block that can not change without a large amount of ether being slashed.[7] This mechanism makes ether an attractive payment asset in terms of time to final settlement, but has hurdles to overcome for the payments use case to take off, most of which have to do with user experience and persistently high transfer fees.

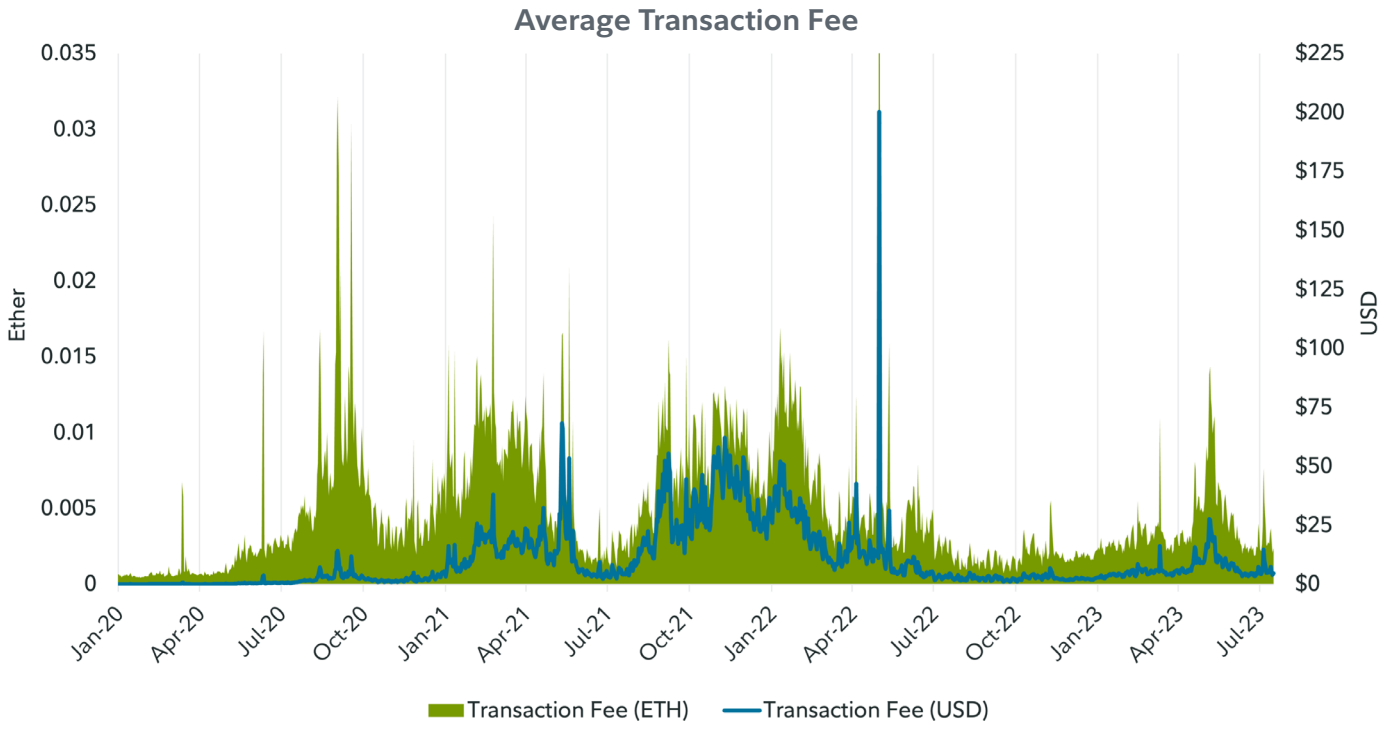
Since The Merge, payments for NFTs have consumed the second-most amount of network fees behind transactions related to decentralized finance (DeFi).[8] NFTs are denominated in ether, which inherently experiences price volatility. For merchants selling an NFT for 1 ether, this amount represents greatly varying purchasing power depending on ether's market price. This variance degrades the experience, mostly on the sell-side, and is a common issue cited for many digital assets claiming payment use cases.

6 https://twitter.com/VitalikButerin/status/1588669782471368704?lang=en

7 Slashing is the destruction of some of a validator's stake and the forced removal of the validator from the network. This happens in response to a dishonest proposal or attestation of blocks, or simply put, an attempted attack on the network.

8 https://ultrasound.money/

Although the Ethereum network has a wide range of transactional options, transferring value directly makes up a substantial portion of the network's usage; peer-to-peer transfers have burned the third-largest amount of ether since The Merge. The largest issue that detracts from ether's payment use case is the fee volatility. Ethereum's dynamic fee model causes fees to rise quickly and sporadically. The variable price of transacting potentially limits payment use cases, while degrading the Ethereum user experience by not being a reliably cheap value transfer network. Users are frequently met with the decision of transacting now at an inflated cost versus waiting to delay their transaction until network activity subsides. This variable has forced developers to be creative in hopes of maximizing the speed and efficiency at which user preferences are met. Moreover, should more real-world assets come onto the blockchain, payments for these assets will likely be carried out using ether, stablecoins, or other tokens. Combining these innovations with lower fees provided by layer 2 platforms could make for an attractive future of payment opportunities on the Ethereum network.



Source: Coin Metrics, 07/16/2023.

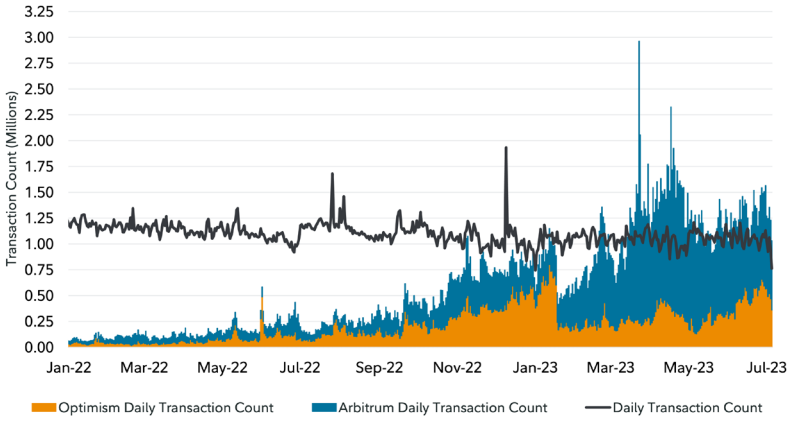
Network data shows that ether is used as a means of payment, albeit one for digital asset native payments (rarely for goods and services overall and on a relative basis compared to bitcoin). However, Ethereum's potential as a payment network has not quite reached its peak because of the difficult user experience that fees and price volatility can cause. This concept will be present throughout this analysis as Ethereum developers seek to optimize the network for future use cases. Whether ether becomes a mainstream form of payment could heavily depend on how soon the community can deliver on hurdles, such as ease of use, real-world transactions, and secure, low-fee transfer options.

Valuing Ether Based on Demand

Because applications on the Ethereum network require ether, increased adoption of the Ethereum network could lead to the increased price of ether and value accrual to ether token holders due to supply and demand mechanics. Additionally, investors should consider revisiting demand-side models as Ethereum scaling progresses. Judging where new users are coming from and the use cases they seek may help investors determine where the trends of value accrual could be heading.

The chart to the right shows a promising story for value accrual to the base layer (Ethereum), the native blockchain that finalizes transactions and ultimately translates network usage into value for ether. Conversely, layer 2 networks (Arbitrum and Optimism) are those built on top of the base layer, which handle transaction execution and rely on the base layer to provide security and transaction confirmation. Despite a bear market, Ethereum layer 1 transactions have remained quite steady at around 1 million transactions per day, while the price of ether has decreased 52% since the beginning of 2022. Additionally, there has been an uptick in layer 2 transaction volumes, while layer 1 volumes have held up. This may be signaling that there is a level of sticky demand on the base layer, while new demand is originating on layer 2s. This trajectory could suggest that value will continue to reliably accrue to the base layer even as layer 2s become more mainstream.

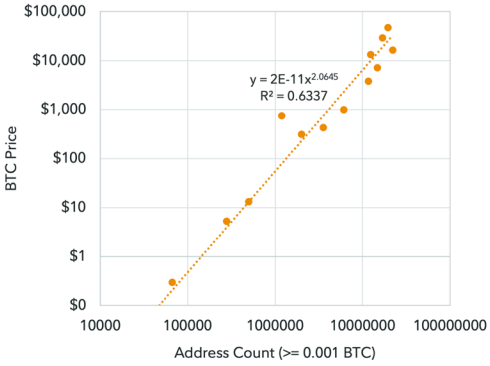
Ethereum Layer 1 vs. Layer 2 Daily Transaction Count



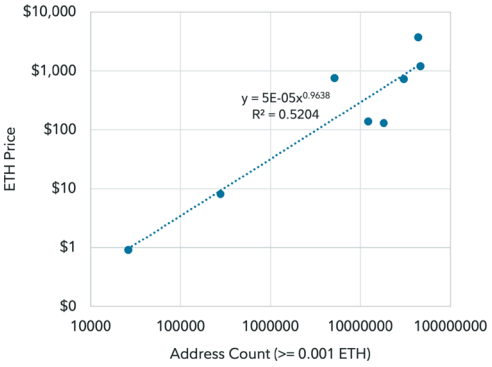
Source: Etherscan and Arbiscan, 07/05/2023.

- Measuring demand for ether as a monetary asset can be difficult. Metcalfe's Law, a popularized economic principle that suggests a relationship between address growth and price, represents a proxy for demand and price of bitcoin. We found less evidence of this type of demand-price relationship when examining ether compared to bitcoin.

Bitcoin Price and Address Count Relationship



Ethereum Price and Address Count Relationship



Source: Glassnode, as of 07/05/2023.

After all, if bitcoin is primarily understood as an aspiring monetary good, then we reasonably expect the relationship between asset demand as measured by number of addresses and price to be stronger. For ether, this apparently weaker relationship may mean that its value is derived via alternative sources, such as network usage, rather than simply demand for holding the asset itself.

Risks to the Demand-Side Model

1. Ethereum's core value arguably comes from the usability layer, which is not effectively captured in a model measuring adoption via addresses rather than measure of transactions, volume, or usage.
2. While data has shown a relationship between address growth and price of ether, there is no guarantee that this relationship will continue in the future.
3. The model is only a demand-side model and, as discussed earlier, ether's supply schedule may change in the future. Therefore, even if demand increases, the price of ether may not change or perhaps even decline if supply increases as well.

Investment Thesis 2: Ether as a Yield-Bearing Asset

Why and How Does Ether Provide Yield?

Ether is a fundamentally different asset since The Merge. Not only is the network consuming significantly less energy, but also provides a yield for those willing to lock up their ether on the consensus layer. The switch to proof-of-stake, a different consensus mechanism in which validators stake their assets to validate network transactions and help secure the network, is a turning point in Ethereum's security model. Now, one could argue that the protocol maintains or even increases its security with lower payments compared with proof-of-work by introducing penalties for validator misbehavior.

Validators contribute resources to the network and perform assigned duties to help Ethereum reach consensus and are financially rewarded for doing so. Below is a brief breakdown of the various validator duties and rewards:

Validator Yield Generators	Task Definition	Source of Ether Rewards	Drivers
Attestations	The act of voting on one block in every epoch (32 blocks) as valid	Newly minted ether tokens from the Ethereum protocol issuance	Internet speed, uptime of node, and the number of active validators
Block Proposals	Build a block (locally or outsourced) and share it with the network when assigned to do so	Newly minted ether tokens from the Ethereum protocol issuance	Internet speed, uptime of node, and the number of active validators
MEV (Maximal Extractable Value)	Value that can be extracted by the proposing validator based on the ordering, inclusion, and exclusion of certain transactions within a block	Users	On-chain activity (arbitrage and liquidation opportunities)
Tips	Incentive paid to the proposing validator for including a transaction in a block	Users	On-chain activity: Higher urgency of transaction execution equals higher tip

Source: Ethereum.org

Attestations, or votes, are submitted by each validator once per epoch[9], a period of 32 blocks when the validators propose and attest for blocks. These votes include key data points describing what each validator sees as the correct contents (blocks) of each epoch. Combining these votes together and imposing some rules that determine valid and invalid votes enables the network to reach consensus on the blockchain and provide economic finality. Ethereum's economic finality,[10] or the cost of reverting to a finalized chain, is worth at least one-third of the total staked ether, which is more than $15 billion as of July 2023.[11] This security threshold increases with the value of ether as well as the amount of staked ether.

Block proposals occur less frequently per validator as only one is selected to perform this task per slot, equaling 32 proposers per epoch. The selection method among the pool of validators is done pseudo-randomly and is correlated with a validator's effective balance. Effective balance refers to the amount of ether that is impacting the accrual of rewards. The greater the amount of ether at stake, the greater the potential rewards. The maximum effective balance for all validators is 32 ether and any balance above this amount does not increase possible rewards.

In addition to the value received from the protocol, the proposing validator will receive tips that users pay for inclusion in a block, as well as MEV, which is value that can be extracted by the validator or others based on the ordering, inclusion, and exclusion of certain transactions within a block. While potential rewards coming from the protocol are based on the number of active validators, the additional income from tips and MEV are directly correlated to network congestion and activity.

Attestation and block proposal rewards are paid directly from the protocol minting new ether. These rewards can be thought of as an incentive from the protocol to uphold its security. The proof-of-stake model allows the network to pay as little as possible for its security budget by introducing penalties and slashing deductions. The potential rewards accrued from the protocol can be calculated using the formula below, where the base reward is equal to the average validator reward per epoch:

Base reward = effective validator balance * (16 * sqrt (total staked ether))

The key takeaways from this payout structure are that the base reward is proportional to the validator's effective balance, incentivizing validators to have the maximum 32 ETH staked, and inversely proportional to the number of network validators. The more validators, the greater the overall issuance, but the smaller the average reward per validator. The rationale for this issuance formula is to ensure enough validator participation because higher yields are paid if the validator set is small, while also guaranteeing that unexpectedly high issuance will not occur if many validators participate.

9 A period of 32 blocks (technically slots), totaling 6.4 minutes.

10 Source: The Block, as of 05/24/2023

11 https://collective.flashbots.net/t/mev-share-programmably-private-orderflow-to-share-mev-with-users/1264

This specific balance of issuance has allowed ether to sustain providing yield in real terms. Since The Merge on September 15, 2022, 53% of validator revenue has come as of July 2023.[12] Below are some other forms of yield that are not paid by the protocol, but rather from users, which offer an interesting connection between network usage and validator income.

MEV:

It is evident that MEV comes directly from user transactions because an increase in user activity typically results in more opportunities for validators to profit from such activity. Since Ethereum has multiple use cases, there are many ways that value can be extracted from user transactions. According to Flashbots, a group working to counteract the centralizing effects of MEV, the most common forms of MEV typically come from arbitrage and liquidations and these opportunities have flourished in highly volatile environments, such as in November 2022.

MEV-Boost, a program designed to outsource the role of building blocks to specialized actors such that rewards associated with MEV can be shared with the entire set of validators, is being used by most validators and has been since The Merge. On November 7, 2022, the average reward per block for validators using MEV-Boost with the Flashbots relay was 0.1 ether. Due to the cascading liquidations and network activity following this day, average block rewards spiked nearly 700% to 0.68 ether per block by November 9, 2022. This sharp increase shows the close relationship between network congestion and validator yields. In periods of high volatility, on-chain activity has skyrocketed, which incentivized higher tips for faster execution and increased the amount of MEV that can be captured from user transactions.

While the relationship between MEV opportunities and validator yield is strong as of July 2023, many different apps, organizations, and individuals within the Ethereum community are exploring ways that change how MEV is managed. Many of these efforts have focused on returning MEV back to the users that generate it, as proposed by Flashbots in their recent announcement of MEV-Share.[13] Other solutions proposed involve burning the MEV that users create or encrypting transaction data such that MEV is more difficult to capture. Whichever route the community pursues could have a significant impact on yields associated with MEV, which, as of July 2023, made up about 24% of validator revenue since The Merge.[14] Unlike application-specific chains, Ethereum has an extensive list of the types of MEV available, which could continue growing as capabilities are enhanced. This variance suggests that one solution may not be sufficient to curtail all MEV away from validators.

12 https://collective.flashbots.net/t/mev-share-programmably-private-orderflow-to-share-mev-with-users/1264

13 https://ultrasound.money/

14 https://ultrasound.money/

Tips:

Since Ethereum's "London" hard fork introduced EIP-1559 in 2021, Ethereum's fee market has changed dramatically. Before the upgrade, proof-of-work miners received all gas fees from any transaction included in the block they mined. Since this fee market change, the network now has two separate types of fees: the base fee and the priority fee (tips). All fees are still paid by the user attempting to execute a transaction; EIP-1559 affects the distribution of these fees once they are paid.

Instead of receiving all fees paid by users, validators only receive the priority fee. The base fees are burned or taken out of circulation. Tips incentivize block proposers to include transactions in their blocks; otherwise, it may be more economically viable for validators to propose empty blocks. For users who have urgency to execute a transaction, a higher tip than other competing transactions in the mempool[15] incentivizes validators to prioritize its inclusion. While MEV plays a significant role in determining which transactions are included in each block, tips still function as an incentive mechanism because validators decide on what transactions to include in their blocks. Since the switch to proof-of-stake, tips have accounted for 22% of all validator revenue as of July 2023.[16]

Valuing Ether Based on a Discounted Cash Flow Model

The value assigned to ether is more easily modeled following the network's shift to proof-of-stake. Demand for block space can be measured via transaction fees. These fees are both burned or passed on to validators, thereby accruing value for ether holders. As a result, fees and ether value accrual should be inherently related over the long term. An increased number of Ethereum use cases creates greater demand for block space, which leads to higher fees and greater value and utility in the form of yield rewarded to validators.

This relationship is shown on the next page using a simplistic discounted cash flow model. The outcomes of such a model vary drastically depending on one's growth assumptions and discount rates, as is always the case with high-growth cash flow models. The purpose of building such a model is not to provide an estimation of ether's fair value, but rather to depict the relationship between network usage and value accrual. Additionally, it can show an analysis that models the value of ether based on assumptions regarding future estimation of fees paid to Ethereum stakers.

As a starting point, the chart on the next page, "Observations & Assumptions," shows Ethereum's average daily network fees paid in U.S. dollars since the implementation of EIP-1559 in August 2021. This was calculated using a two-stage discounted cash flow model to estimate an initial period of continued aggressive growth in fees because of adoption, followed by a lowered rate of fee growth as scaling could reduce the upper bound of fee growth regardless of utility derived by Ethereum users.

15 A mempool is a list of pending transactions to be included in upcoming blocks.

16 https://ultrasound.money/

Observations & Assumptions	
Average Daily Network Fees since 08/05/2021 (EIP 1559)	$ 18,747,563
Annualized Network Fees	$6,842,860,350
Discount Rate	10%
Terminal Growth Rate	5%
Total Ether Supply	120,000,000

Output	
Total Market Cap	$ 250,834,718,284
Modeled Price per Ether	$ 2,090

Cash Flow Model			
	Ether Fee Estimate	Growth Rate	Present Value of Ether Fee Estimate
2023	$ 6,842,860,350	0%	$ 6,220,782,136
2024	$ 8,553,575,437	25%	$ 7,069,070,609
2025	$ 10,691,969,296	25%	$ 8,033,034,783
2026	$ 12,830,363,156	20%	$ 8,763,310,673
2027	$ 15,396,435,787	20%	$ 9,559,975,279
2028	$ 16,936,079,366	10%	$ 9,559,975,279
2029	$ 18,629,687,302	10%	$ 9,559,975,279
2030	$ 20,492,656,032	10%	$ 9,559,975,279
2030+	$430,345,776,680	*5% (Terminal)*	$182,508,618,967

Disclaimer: These figures are hypothetical and for illustrative purposes only.

Over 70% of the token value associated with this model comes from the terminal perpetuity growth, which is the assumed growth rate for all years beyond 2030. This result is common when projecting the future of high-growth businesses and part of the reason why using a discounted cash flow model is useful only in theory.

		Terminal Growth Rate			
		2%	3%	4%	5%
Discount Rate	8%	$2,075	$2,382	$2,843	$3,612
	10%	$1,493	$1,635	$1,825	$2,090
	12%	$1,151	$1,227	$1,323	$1,446
	15%	$ 843	$ 879	$ 921	$ 972

The sensitivity model shown to the left further depicts the modeled price's responsiveness of the modeled price to the assumed growth and discount rates. Understanding the relationship between ether and users' willingness to pay fees is extremely important. However, relying on a model that is highly sensitive to small changes in future growth assumptions may not be so useful.

Disclaimer: These figures are hypothetical and for illustrative purposes only.

Risks to Discounted Cash Flow Model

1. The relationship between ether and the value it provides to network users may weaken if scaling technology erodes fee revenue unless volumes increase and offset this margin compression.
2. Modeling the future of any growth-sensitive asset and applying an associated discount rate is highly subjective, and, therefore, valuation may only be useful in theory.
3. Current efforts to minimize the negative effects of MEV will improve user experience, but may degrade yield. This and many other important minor details have not been adjusted or accounted for in this simple model.

Conclusion

There is virtually no doubt that Ethereum is a leading blockchain technology platform that enables developers to build dApps, many of which are capable of things that could not be done on Bitcoin's network due to Ethereum's superior programmability. This has led to some of the largest and most active applications in the digital asset ecosystem being built on Ethereum and ether continuing to hold the second-largest market cap position (behind only bitcoin) for years.

However, the question investors are asking is, "does this increased developer and application activity translate to value for ether?" We have shown that, in both theory and data thus far, increased activity on Ethereum's network drives demand for block space, which, in turn, generates cash flow that can accrue to token holders. What is also evident, though, is that these various drivers are complex, nuanced, and have changed over time with various protocol upgrades and the emergence of scaling developments, like layer 2, and may change again in the future.

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