The Investment Case for Layer 1s: Big Value in the New Internet

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INTRODUCTION

Osprey is excited to be launching research coverage and introducing price targets on the large cap "Layer 1" protocols: Polkadot, Solana, Ethereum, Bitcoin, Avalanche, and Cardano. Layer 1 protocols are new decentralized, open-source technologies experiencing hyper growth in user adoption and transaction value. Our thesis is that these networks are the backbone and future of the next generation internet and as they mature, they provide un-correlated sources of return for institutional portfolios.

Crypto as an asset class has arrived and we've identified a gap in the market for institutional grade investment research to steward capital into the space. Our initial report is both a primer on the specifications of the protocol technologies but also a guide to where we see liquidity and excess return for institutional portfolios. We have a point of a view, but we are open to debate. Like all things new, and particularly in crypto, the facts change and we intend to change with them. With that, we are eager to begin.

3 YEAR PRICE TARGETS

Upside Rank	Protocol	Token	Current Price	Base Case	Base % Δ	Bull Case	Bull % Δ	Bear Case	Bear % Δ
1	Polkadot	DOT	18.27	98	436	139	660	50	174
2	Bitcoin	BTC	39,569	167,864	324	230,487	482	106,111	168
3	Solana	SOL	100.19	239	139	312	211	165	65
4	Ethereum	ETH	2,942	5,382	82	8,347	184	3,900	33
5	Avalance	AVAX	72.19	100	39	136	88	72	0
6	Cardano	ADA	.89	1.03	16	1.21	36	.86	-3

*Prices in $USD. Protocols are ranked by Base Case upside potential. Prices as of 4/24/22.

PM SUMMARY

Polkadot: It's fast and cheap, yes, but it's upside potential comes from interoperability among, eventually, hundreds of custom purpose parachains. Polkadot is a dark horse in the battle of Layer 1s but we see it having the greatest potential to develop true crypto primitives and therefore has the highest upside in our framework.

Bitcoin: The market has formed consensus around Bitcoin as the main network for store of value and density for value transfer. As regulatory frameworks accept the asset, and institutions (and perhaps Central Banks) embrace the asset we see big flows driving value. It's a must own scarce asset.

Ethereum: Network effects are real and Ethereum already supports the lion's share of decentralized finance (DeFi) activity, Non-Fungible Tokens (NFTs) and some of the most popular decentralized applications (dApps) in the space. After the merge to proof-of-stake (PoS), the crypto behemoth will drastically increase throughput to support the largest crypto ecosystem of users which is extremely bullish.

Solana: The protocol is host to Serum, an FTX sponsored, decentralized central limit order book (CLOB), which can provide liquidity, globally, for real-world assets. We think it is an incredible opportunity that could make trillion-dollar markets and facilitate capital formation in the existing economy, if fully realized. We are bullish but that vision is still outside our time horizon until further notice. Besides Serum, Solana fights Avalanche for GameFi share and the battle will be tight for dominance.

Avalanche: The gaming space has a massive total addressable market (TAM) of $335Bn. Avalanche can capture a portion of GameFi market share over the next few years as it attracts large gaming developers to build on its high throughput network. Watch out as more gaming developers integrate Avalanche DeFi and non-fungible tokens (NFTs) functionality into established games with millions of players.

Cardano: The protocol is lagging in many areas of realized development having just launched smart contracts and custom token features. It has many of the same features as other layer 1s have had for a while. Cardano is heavily based in research to launch new primitives, and while the project takes a thoughtful approach, it is slow moving as a result. The market cap is large but don't be tempted: We do not currently see significant upside.

VALUATION METHODOLOGY

Our price targets operate on a three-year time horizon (3Y). While we are aware of the adage that, in crypto, a month equals a year, we think that we can reasonably argue that the current drivers of our growth assumptions will be fully realized, or not, within this time frame. Of course, as facts change, we will change with them, creating a rolling framework that updates targets perpetually.

US$ Price Target = (NVT Multiple * 3Y Average Transaction Value)/3Y Projected Circulating Token Supply

To break this down further:

NVT = Network Value to Transaction Value multiple. This consists of:

Numerator: Circulating Market Capitalization (in US$) which is US$ token price x current circulating supply.

Denominator: Average trailing 90 day daily transaction value (in US$). Our forward projections for transaction growth or contraction are laid out in the investment thesis section.

We use a trailing NVT and average multiples over the last 90 days.

Given the nascent trading histories of Layer 1 blockchains, we feel that it was conservative to only focus on the drivers of transaction value growth and token supply to derive our price targets without adjusting the NVT multiple.

Fully diluted market caps and snapshot of the daily NVT on the day of the report are also used for comparison purposes, but we drive our price targets from a forward estimate of circulating value in order to be consistent with both token supply and user demand assumptions within a three year time frame. For adjusted circulating supply, we incorporate validator fees, burned fees, and projected burned fees in our analysis as well as vesting schedules over time where applicable. Supply inflation rates are considered including issuance rates based on current and projected staking rates.

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Polkadot: Killer Dapps, Apply Within

PM Notes:

1. Transaction growth? With 13 of 100 recently onboarded parachains, you haven't seen anything yet. We see upside of 436% and find the long term value of one DOT to be worth $98 in our Base Case using a trailing network value to transaction (NVT) multiple of 89x on 2.8x year-over-year (YoY) transaction growth.

2. In our Bull Case we see 660% upside and a price of $139 using the same NVT multiple of 89x and 240% YoY transaction growth. In the Bear Case we see slower transaction growth of 200% YoY with an implied price of $50 at a 89x NVT multiple.

3. Primed for Growth, All Systems Go – Parachains are finally here. The potential for disruption is real. We have high expectations for Polkadot to span a whole new set of crypto primitives.

4. Fast, Cheap, Secure, Interoperable, Decentralized – what more do you want? How about tight tokenomics. We estimate that at an average lock rate of 52% staked DOT, inflation must achieve 10.78% to keep up with our transaction value base case assumptions.

Model Assumptions

We assume a predictable schedule of parachain auctions occur every two weeks for the next 3 years. We also consider the average total DOT locked in the first 13 parachain auctions to be 13.42M. We assume an average total DOT lockup in the first 26 auctions, a projected yearly estimate, to be 346.24M and discount the estimate by 20% assuming fewer DOT will be locked up over time on average as more auctions are held. We also use a conservative prior year 90 day average transaction growth multiple of 2.84x which assumes network transactions will continue to grow steadily at the same rate YoY for our Base Case. We recognize that fees from transactions and slashes from network misbehavior/misconfigurations are sent to the Polakdot Treasury where

Category: Layer 1/0 Protocol

DOT/USD: $18.27

ETH/DOT: .00621

https://polkadot.network/
Polkadot Block Explorer

Consensus Mechanism:

Byzantine Fault Tolerance (BFT)

Validator Selection Mechanism:
Nominated Proof of Stake

Staking Yield: 14% APR

Circulating Token Supply:

987.58 DOT

Locked Token Supply: 631.31M DOT
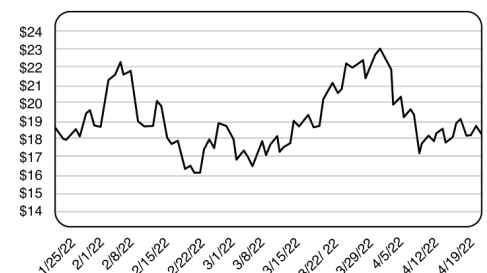
Fully Diluted Tokens:

$20.20Bn

US$ Circulating Market Cap:

$18.05Bn

Crypto Market Cap Rank #: 13

DOT 90 Day Price

they're slowly burned if unused; however the yearly burn is immaterial to network inflation economics at <1% of circulating supply.

INVESTMENT THESIS

Polkadot's 90 day average NVT, a trending predictor of longer term network value, shows its ability to settle > $6Bn a day and demonstrates a convincing valuation relative to other layer 1s. We think the market may be undervaluing the network.

NVT = Market Capitalization ($)/Transaction Volume ($); Polkadot Circ. Mkt Cap ≈ $18.05Bn

	DOT	SOL	ETH	BTC	AVAX	ADA
Tx Daily Volume ($)	61.24M	367.70M	2.39Bn	28.18Bn	28.34Bn	15.30Bn
Tx 90 Day Avg Volume ($)	164.87M	608.59M	5.87Bn	16.00Bn	19.60Bn	30.97Bn
NVT (Daily)	293.84	90.89	148.63	26.71	.68	1.4
NVT (90 Day Trailing Avg)	89.13	54.92	49.14	53.10	.99	2.05
FD NVT	122.52	84.12	49.14	52.02	1.46	1.29
Circ. Market Cap ($)	18.05Bn	33.42Bn	354.60Bn	752.67Bn	19.39Bn	29.94Bn
FD Market Cap ($)	20.20Bn	51.20Bn	354.60Bn	831.85Bn	28.60Bn	39.96Bn

(Figure 1) Comparable L1s – NVT Multiples; Source: Coin Metrics, CoinMarketCap, Osprey Funds; Tx=Transaction, FD=Fully Diluted

For example, consider the NVT ratio 90 day moving average (MA) has been trending downward since November 2021. The network's value is trading at a discount relative to transaction flow.

2.84x transaction growth muliple; NVT 90 Day Avg ~89x

Polkadot – Base Case	2022 - Year 1	2023 - Year 2	2024 - Year 3
Tx Daily Volume ($)	61.42M	208.82M	710.00M
Tx 90 Day Avg Volume ($)	164.87M	560.57M	1.91M
NVT (Daily)	293.84	293.84	293.84
NVT (90 Day Trailing Avg)	89.13	89.13	89.13
FD NVT	122.52	122.52	122.52
Circulating Market Cap ($)	18.05Bn	49.96Bn	169.88Bn
FD Market Cap ($)	20.20Bn	68.68Bn	233.52Bn
Circulating Supply	987.58M	1.10Bn	1.21Bn
Price ($)	18.27	45.67	139

(Figure 2) Polkadot – Base Case; Source: Coin Metrics, CoinMarketCap; Tx = Transaction, FD = Fully Dilluted

We recognize that only a few parachains have been onboarded to the main network so far and account for slightly over 10% utilization of the network's 100 slot limit, which is inherent in our growth projections. New parachains will be added to the network after auctions with additional flows of transactions as a result of usage. That's a lot of upside as new chains come online with no shortage of projects wanting to be involved. For example, in parachain

auctions 6 through 11 there were ten additional projects that bid on a slot but did not win.

Base Case – $98: In three years we see upside of 557% and project Polkadot's circulating market cap to be six times larger at $119Bn, and 5.3 times the current price at $98 per DOT using an NVT of 89x and transaction growth of 2.84x. Our projections are based on the belief that parachains will be an attractive protocol primitive that both entice and enable developers to build completely customizable projects at scale.

1. New primitives: At its core, Polkadot is a blockchain relay chain which manages communication amongst a web of independently built blockchains called Parachains, or shards of the network. Unlike other layer 1 protocols, the Polkadot blockchain, known as the Relay Chain, is purpose built only to coordinate and secure connected and independent Parachains. Often referred to as layer 0, a classification we endorse, the Relay Chain is a breakthrough in blockchain architecture.

    Parachains do not operate in silos unlike Ethereum, Bitcoin and other similar protocols. Instead, security is shared and economic and transactional capabilities amongst other parachains are connected. For example, Acala is a parachain whose vision is to connect autonomous economies on Polkadot and supports a cross-chain stablecoin for borderless value transfer for all chains on the network. This includes the ability for users to govern monetary policies of the stablecoin. Astar is also building an application platform dedicated to DeFi, NFTs, DAOs and anything related to web3 / decentralized applications.

    Take another example: a future identity verification chain may want to prioritize security while a gaming application may value speed. Ethereum 2.0 is a one-size-fits all solution and putting both on the same chain means that the technology constraints of homogenous sharding may force both the identity verification developer and the gaming developer to compromise in ways that make each product sub-optimal. If given a choice to have more optionality, on sound technology with enhanced security, why wouldn't a developer always choose Polkadot over Ethereum? That is where the vision has the potential to deliver on reality.

2. Why Parachain? Strength in Unity: When faced with the daunting prospect of having to bootstrap a network of validators from scratch, for instance like on an Avalanche subnet, development teams with novel blockchain based projects will be highly motivated to take advantage of the Polkadot Relay Chain and ecosystem. Interlinked parachains excel at communication amongst themselves while Layer 2 scaling solutions on Ethereum cannot interact in a similar manner since transactions are restricted to each individual chain.

    Separate layer 2 solutions cannot interact, even for simple operations like exchanging transaction metadata and communicating between projects on another layer 2. It also creates headaches from a user perspective since separate accounts for each layer 2 solution must be created. Layer 2 solutions are separate chains from the Ethereum network, and while it may be faster to transact on them since these chains are not as congested, blockchain security suffers as a result. Layer 2s have fewer nodes supporting network processing and security activities. This can lead to security concerns and lack of decentralization, whereas Polkadot parachains participate in a shared security-as-a-service model across the entirety of the protocol.

3. Code it up: Polkadot supports EVM which is compatible with Ethereum's dApp ecosystem, and also WASM which is native to Polkadot. Any developer can use common languages like C++, Rust, etc. to program on the chain. Polkadot provides compatibility to any parachain that builds on it, which is comparatively harder to find on other layer 1s and dramatically lowers the barriers to entry for any new non-crypto native developers/ teams to jump on board.

    Bull Case – $139: We find upside of 660% by using a 89x NVT multiple and 3.4x transaction growth in our bull case to arrive at an implied price of $139. Interesting parachains like Nodle that implement real-world use

cases will outcompete their counterparts like Helium which aims to achieve a similar type of IoT connectivity with its own protocol. Nodle is a Bluetooth low energy network that aims to connect millions of smartphones and IoT devices. It already has 5M daily active smart phones utilizing the network with millions more IoT devices and moves 100GB of data daily. In this scenario, we also see parachains as thriving ecosystems, slots filling up and crowdfunding exceeding our DOT contribution expectations. As a result, transactions grow by 20% more than in our base case with increased project activity. We see a clear preference into parachain usage over layer 2 Ethereum solutions by market participants due to customization benefits, as well as quick transactional and operational capabilities.

Bear Case – $50: In our bear case, we use the same 89x NVT and see a scenario in which transaction growth on the network falls off its current trajectory to 2x YoY growth due to lower community enthusiasm than we expect. While we still see upside of 174%, Parachain DOT crowd funding averages fall and the initial excitement about new parachain launches wanes. Transactions, while still on a growth trajectory, slow as new project launches are not as large in scale and attract less activity overall. Identity projects like Ontology don't achieve initial growth expectations and falter slightly.

DEEP DIVE: AN INITIATION ON POLKADOT

The Polkadot network is fast, works in parallel, and can theoretically handle more transactions per second (TPS) (1 million TPS at full deployment) than any competing network, including Solana and Avalanche. Parachains that use Polkadot also remain completely independent while benefiting from an extremely high degree of design customization and flexibility. Polkadot is a standout project in the wider ecosystem of layer 1 networks and layer 2 scaling solutions by implementing some of the major improvements below:

1. Heterogenous sharding for project customization and network effects
2. Network sharding for parallel transaction processing / faster throughput, theoretically 1M TPS
3. Auction mechanism (bid-to-survive model) where stronger, value-based parachains endure
4. High staking rewards compared to other layer 1s
5. Ease of development to bolster future ecosystem growth

Carded at the Door

Distributed identity frameworks could be one way that Polkadot differentiates itself from other layer 1 offerings. ONTology is one example of an identity parachain taking advantage of the heterogenous sharding model so the project does not have to compromise in building a decentralized identity solution. ONTology also makes its identity solution available to all blockchains supported by Polkadot for the greatest reach. Their parachain includes authentication and authorization functionality to maintain a digital identity and ID-based credit scores for on-chain digital asset transactions. This is a great example of why a project would want to leverage Polkadot's framework to optimize architecture and gain scale in ways they would not be able to on other layer 1s.

Stake It 'Till You Make It

Polkadot runs using DOT as its native token. This is a proof-of-stake system where the economic rewards accrue to network value and transaction fees via inflation, rather than token scarcity. DOT holders both own and govern the wider network and earn fees based on user transactions. Total supply was initially determined at 1Bn DOT and is now 1.19b due to network inflation.

The staking inflation rate is key, since it is one of the highest when looking across other comparable protocols and is a nice kicker in addition to participating in the ecosystem in other ways to earn yield, like parachain auction bonuses, tokens, etc.

The annualized reward rate for delegating DOT is around 14%. To stake DOT and earn network fees, users are required to stake at least 160 DOT (~$2880 @ $18 DOT) and are bound to a lockup period of 28 days.

A balancer mechanism is coded into the Polkadot protocol to achieve internal inflation homeostasis. The network attempts to achieve an ideal staking rate of 50% of total supply to target a 10% circulating supply inflation rate and 20% reward for validators. The inflation curve of the network and rewards for validators drop off precipitously after the target of 50% staking has been reached to balance the network. ~53% of eligible DOT are currently being staked which is above the network's inflation target.

Network Architecture/Technical Features

Parachains have their own tokens and governance – again they exist as separate chains - but rely on the overall Polkadot system and Relay Chain for security in a security-as-a-service model, including transaction processing, block validation and finalization/consensus by nominators and validators. Ethereum transaction speed is limited since every node is required to validate every transaction that takes place on the chain. The Polkadot relay chain does this in parallel and creates blocks 10x faster. The ecosystem benefits from growth which seems like an obvious statement, but as more users connect, they bolster security and consensus mechanisms of every parachain, regardless of use case.

The relay chain provides some serious scalability advantages and can have compounding affect on future growth. Parachains can also connect via a bridge to external networks such as Bitcoin, Ethereum, or other layer 1 solutions. Ultimately parachains act as their own nation-states, "with their own communities, rules, economics, governance, treasuries and relationships with external chains." This interoperability feature could easily make the network more valuable compared to other layer 1s by enabling communication with other chains to trade value, whether in gaming, finance, or education applications. Instead of a walled garden, it opens the ecosystem to rich possibilities. There are a few chains attempting to achieve external connectivity, but even fewer that are attempting broad reaching connectivity relating to any type of transaction among disparate ecosystems.

Easy Road to Code

Polkadot is built on Substrate, a framework specifically designed to build blockchains that was originally developed to be a modular solution to speed the development of Polkadot. It allows fine grained control over storage, economics, and consensus an allows developers to use common languages like C, Rust, and Go via its base layer, WebAssembly (WASM). WASM was built specifically so that anything compiled would appear the same in a browser, regardless of language. Separately the Ethereum Virtual Machine (EVM), built to run various smart contracts to simulate a physical machine, cannot handle as many wide ranging operations as WASM.

It also requires developers to pre-compile code which initially takes more time. WASM is more suitable for network participants running different types of hardware and supports Polkadot's no-fork upgrade capability for fewer disruptions.

Layer 2 projects on other competitor networks are tethered to the tokenomics of their individual protocols and must learn layer 1 native languages. Projects built on Polkadot do not have to conform to a standard set of requirements, constrained by the chain they're building on; instead, they have freedom to customize and tailor for their own use cases. Similar protocols don't offer this type of independence which is a key differentiator to the future growth of Polkadot.

Parachain Auctions – Going Once, Going Twice…

There are a totally of 100 parachain slots that are auctioned off on a known, regular schedule so parachains can connect and utilize the Polkadot network. These slots enable parachains to bid, either through crowdloans or through their own funds, to win auctions to utilize the network for two years. After 96 weeks, these projects must bid again to gain use of another slot. Additionally, parathreads, which are exactly like parachains in that they are their own blockchains, pay per block instead of bidding on slots in auctions and are not as capital intensive to launch. The timed lease and pay per block model are the ultimate selector of on-chain value, as projects must provide a level of value to:

1. Outbid other parachains vying for a spot – eventually auctions will become more competitive over time as there are only 100 slots; and

2. Attract or generate enough capital to bid and win auctions or pay per block to continue their use case/ survival as a project.

The Polkadot auction process is novel and is the ultimate driver to attract quality projects, as it sets the stage for a bid-to-survive model accretive to future quality network use cases in the long run. Parachain and parathread projects also offer bonuses for crowdloan contributions and distribute native tokens for DOT contributed to their projects so users can participate in their growth.

This sets Polkadot apart from other protocols and creates a rich environment for projects to incubate and compete for space, as weaker parachains will be separated from those that generate true/lasting value for the wider network and are economically endorsed by its users.

Transaction Speed... Don't Blink

Architecture really meets reality is in Polkadot's transaction speeds. Polkadot makes big claims that, if true, deliver on the scale problem that has hampered legacy blockchains so far: Forget Bitcoin at 7 transactions per second (TPS). At theoretical maximum, with all nodes in operation for maximum sharding, Polkadot currently estimates the ability to process 1,000,000 TPS. Compare that to the Visa credit card network that currently does around 1,800 TPS on a theoretical maximum of 65k. Other layer 1s like Solana and Ethereum after the implementation of sharding claim future TPS of 65k and 100K respectively.

Teamed Up

Polkadot has a deep bench. The project founder is Dr. Gavin Wood – Co-Founder and CTO of Ethereum. He is joined by industry veterans Peter Czaban and Robert Habermeier. In addition to Polkadot, the team has created the Web3 Foundation: a large, Swiss-based, research organization staffed to work on developing the Polkadot protocol and Parity. Parity is a German/UK based 150 person company that is building applications and the application developer tools using Polkadot (though 30% of the workforce is remote across 9 countries, highlighting the scope of this effort). This is an A+ team.

Growth by the Numbers

Polkadot Reddit touted 40k members at the end of April. Discord had 22k and YouTube was at 44.5K members. Polkadot's official Twitter account now boasts 1.2m followers. Social media shows people's interest in the network has been increasing, but does the same show in ecosystem metrics? Unequivocally, yes. It is estimated that there are now 350 teams building on the protocol, up 30% from last year. During 2021, these teams raised a combined $650m in early stage funding for Polkadot-specific projects. Polkadot, and its sister chain Kusama, had 3 million user accounts created by the end of December.

Better the Second Time Around

Polkadot was conceived by Gavin Wood, who was also an important figure in building Ethereum before Polkadot. He was CTO and co-founder in Ethereum's early days and invented Solidity, Ethereum's programming language for smart contracts. He was critical to Ethereum's early development but decided to part ways in 2016.

Wood believed he could create a system that would iterate on Ethereum's shortcomings in network architecture and design to achieve scalability, security and speed that was superior, including the idea that Ethereum transaction speed was limited by the idea that every node is needed to validate every transaction that takes place on the chain.

Kusama was also launched by Wood in 2019 which is devised from an almost identical codebase as the Polkadot protocol. It serves as the sister chain to Polkadot and was originally conceived as a test network with faster slot leasing schedules for testing before a parachain migrated to Polkadot for go-live. Over time Kusama has developed its own ecosystem and some projects have even decided that the network economics are preferrable and are happy staying on the Kusama chain.

Future – Making Crypto Inroads

The future of Polkadot is no doubt a bright one. Millions of user accounts have been created while many parachains are building an incredible variety of applications with more to come. Parachains have recently launched, completing the implementation of Polkadot's original vision and has created a deluge of applications just now starting to implement their own solutions. Polkadot has massively improved on many layer 1 chain limitations including shared resource inflexibility and uncustomizable network economics.

While Ethereum still maintains the lion's share of base protocol dominance, Polkadot has a true shot at making inroads in adoption. Polkadot has delivered on its most important vision when parachains launched. This functionality IS Polkadot, a heterogeneously sharded chain. People believed in the vision before and continue to now that the original vision was fully delivered. Its possibilities in the layer 1 world are vast, especially with its native ability to connect and interact with distinct chains in the crypto ecosystem. Could it be the layer 1 solution to ultimately rule them all? Yes, but regardless of the outcome Polkadot can still thrive in a multichain world.

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Solana: Timing is Everything

PM Notes:

1. It's always sunny in Solana Beach – Using a trailing network value to transaction (NVT) multiple of 55x and 80% year-over-year (YoY) transaction growth we find the long term value of 1 SOL to be $239 in our Base Case with 139% upside.

2. In our Bull Case, we use the same 55x NVT multiple and a 120% YoY growth rate to arrive at a price of $312 and 211% upside. In our Bear Case, we use the same NVT, but due to competing protocols with similar functionality, see transactions growing at only 40% YoY, a price of $165 and 65% upside.

3. No need to wait in line – Parallel processing of program instructions by separating code from data gives the network distinct speed advantage at 65k transactions per second (TPS) compared to other networks that process instructions one at a time.

4. On time, every time – Proof-of-history speeds up processing by centrally producing a publicly verifiable order of blockchain events so validators do not have to individually check and confirm with other nodes.

5. Crypto meets reality – Serum is a decentralized central limit order book (CLOB), backed by FTX, and a potential backbone that has the ability to set one global price for real-world assets like oil, stocks, and derivatives. We think it is an incredible opportunity on the Solana protocol that could make markets and facilitate capital formation in the real world.

6. In our view, Solana is a top layer 1 contender to host major projects since it is a high performance blockchain with quality, vetted validators, novel network primitives, and a rapidly growing developer and user community.

Category: Layer 1 Protocol

SOL/USD: 100.19

BTC/SOL: .00253

https://solana.com

Solana Block Explorer

Consensus Mechanism:
Byzantine Fault Tolerance (BFT)

Validator Selection Mechanism:
Proof-of-Stake (uses Proof-of-History)

Staking Yield: 5.81% APR

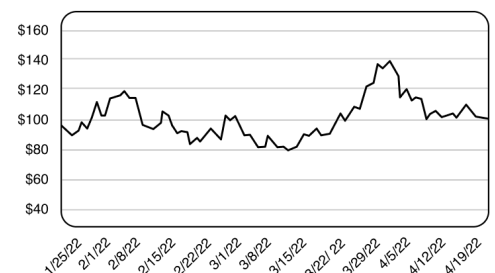**Circulating Token Supply:**
333,567,997 SOL

Locked Token Supply:
65.29M SOL

Fully Diluted Tokens:
511,616,946 SOL

US$ Circulating Market Cap:
$33.42Bn

Crypto Market Cap Rank #: 7

SOL 90 Day Price

Model Assumptions

We consider that the SOL inflation percentage rate steadily declines by 15% YoY over the next ten years (disinflation rate) as defined by the network which ultimately targets a 1.5% inflation rate in 15 years after launch. The network burns 50% of all transaction fees. Daily and wrapped SOL transfers were measured over time.

INVESTMENT THESIS

NVT = Market Capitalization ($)/Transaction Volume ($); Solana Circ. Mkt Cap ≈$33.42Bn

	SOL	DOT	ETH	BTC	AVAX	ADA
Tx Daily Volume ($)	367.70M	61.24M	2.39Bn	28.18Bn	28.34Bn	15.30Bn
Tx 90 Day Avg Volume ($)	608.59M	164.87M	5.87Bn	16.00Bn	19.60Bn	30.97Bn
NVT (Daily)	90.89	293.84	148.63	26.71	.68	1.4
NVT (90 Day Trailing Avg)	54.92	89.13	49.14	53.10	.99	2.05
FD NVT	84.12	122.52	49.14	52.02	1.46	1.29
Circ. Market Cap ($)	33.42Bn	18.05Bn	354.60Bn	752.67Bn	19.39Bn	29.94Bn
FD Market Cap ($)	51.20Bn	20.20Bn	354.60Bn	831.85Bn	28.60Bn	39.96Bn

(Figure 1) Comparable L1s – NVT Multiples; Source: Coin Metrics, CoinMarketCap, Osprey Funds; Tx = Transaction, FD = Fully Diluted

Base Case – $239: For our base case, we used a trailing NVT of 55x and project a YoY 80% YoY transaction growth rate to maintain a linear trajectory and arrive at $239 SOL in three years for 139% upside. As a result, we estimate that the circulating market cap could grow by 160% as a result. SOL has one of the lowest NVT ratios across layer 1s and we believe it is undervalued as a result of its GameFi potential and future uptake of central limit order books (CLOBs) by decentralized applications (dApps) on the protocol.

1. Protocol gaming – We think that transactions will continue to remain on the same upward growth path as the protocol will serve a rich non-fungible token (NFT) gaming ecosystem with its native primitives that enable a seamless in-game experience where computational capability and fast on-chain settlement is paramount. GameFi is composed of play-to-earn where in-game objects are designed as NFTs to represent ownership (i.e. skins, money, physical items).

   Take Star Atlas as an example – it is a play-to-earn game built on Solana that has a massive marketplace for ships, structures, resources (fuel, food, etc.), collectibles for players to trade with others and its own in-game monetary system to build a virtual economy. The gaming space has a massive total addressable market (TAM) in the next five years ($335Bn) and Solana is poised to grow as it becomes one of the main protocol serving the space with its ability to scale to millions, or even billions of users while maintaining low latency for players.

2. CLOB – Solana also offers Serum, a dApp specifically designed to offer central limit order book (CLOB) functionality that will provide the next evolution of asset on-chain price discovery. We think new entrants or existing users of other layer 1s will be drawn to the functionality combined with Solana's speed, composability and lower costs. While other decentralized exchanges (DEXs) associated with other protocols provide automated market marker functionality, a key differentiator of a CLOB is that it enables limit order, bid, and ask functionality like a traditional exchange. Sereum already accounts for $785M and 15% of Solana's total value locked (TVL).

   Liquidity can also be provided at different price levels for on-chain financial and non-financial assets that

allow for capital formation in the real world by interacting with only a smart contract. A decentralized CLOB can set one global price for any type of real-world asset. In comparison, DEX's built on other layer 1s rely on automated market makers (AMM) where a participant must provide liquidity to both sides and only at the market price – while the ultimate function is the same, it is a limited application. We think this is an exciting and promising idea that is far from fully realized with tremendous growth ahead.

Star Atlas already uses Serum to trade all in-game assets and Aurory, a RPG-style game, also utilizes the CLOB for a similar function. It is a decentralized exchange but also provides order book functionality that supports derivatives and borrow and lending activity. The protocol can also be utilized by other Solana programs in need of an order book / matching engine and provides the wider network with access to decentralized liquidity.

Bull Case – $312: In our bull case, it is possible to see transactions grow by 120%, or 50% more than the current rate, if Solana wins more market share than competing layer 1s. Again, we use a 55x NVT to arrive at an implied price of $312 with upside of 211%. Avalanche, in many ways, is also fast and cheap and hosts a CLOB called Dexalot that has strayed away from the AMM model. Solana and Serum must attract additional users from Avalanche's ecosystem and outcompete particularly from an institutional standpoint. In this scenario, we see Serum running hand-in-hand with GameFi to achieve major synergies, as games will leverage CLOBs for quick, in-game trading of objects and running virtual economies. The protocol most outperform in the GameFi space, hosting large, well known developers that can bring proven strategies, port players from traditional, non-blockchain channels and ultimately make high quality games with low user churn.

Bear Case – $165: In a more tepid scenario, we see the network's transaction growth rate halve to 40% but still with upside of 65%. While Solana will continue to gain users from a growing crypto pie in the next three years, other competing protocols, specifically Avalanche, will offer increasingly competitive dApps with similar functionality in the GameFi space. The net inflow of users migrating or onboarding to Solana is muted as a result, and we may see less enthusiastic uptake in both the gaming and CLOB spaces.

Solana – Base Case	Year 1	% Δ	Year 2	% Δ	Year 3
Transaction Daily Volume ($)	367,701,000	120	808,942,200	55	1,250,183,400
Transaction 90 Day Avg Volume ($)	608,586,771	120	1,338,890,895	55	2,069,195,020
NVT (Daily)	90.89	-	90.89	-	90.89
NVT (90 Day Trailing Avg)	54.92	-	54.92	-	54.92
FD NVT	51.20	-	51.20	-	51.20
Circulating Market Cap ($)	33,421,586,891	120	73,531,887,966	55	113,640,190,492
Circulating Supply	333,567,997	4.9	349,745,349	4	364,025,041
Total Supply	511,616,946	4.9	536,541,843	4	558,622,249
Fully Diluted Market Cap ($)	51,200,000,000	120	112,804,744,188	55	174,388,933,979
Price ($)	$100.19	110	$210.24	48.5	$312.18

(Figure 2) Solana – Base Case; Source: Coin Metrics, CoinMarketCap, Osprey Funds; Tx = Transaction, FD = Fully Diluted

We aggregated a few statistics to obtain the value of $USD moving through Solana's network. Unlike Ethereum or other layer 1s, transactions on Solana bundle multiple transfers and include other network activity so we didn't use straight transaction counts to represent transacted value. Instead, we isolated the two statistics below to focus on native daily token transfers. We also used these numbers to derive how we value Solana as a protocol.

1. Daily SOL Transfers

2. Wrapped SOL Transfers

Daily SOL Transfers is a measure of how much of Solana's native token is transferred daily. Wrapped SOL is a token that coverts SOL to the equivalent of Solana's decentralized finance (DeFi) token standard, SPL (Solana Program Library). Wrapped SOL can be exchanged, swapped and interact with other tokens on the network in a DeFi environment where much of Solana's activity occurs.

We see future adoption of Solana accelerating based on real advantages over traditional layer 1s focused on defining functionality inherently built into the network. True speed advantages are secured over competitor chains based on modifications to the underlying network structure and function. We believe more developers will ultimately be attracted in the long term as a large contingent will need a high performance blockchain at scale – Solana meets these criteria due to a thoughtful network architecture from inception.

DEEP DIVE: AN INITIATION ON SOLANA

Why Wait? Just Seperate

65K theoretical transactions per second is a good reason not to wait for anything on Solana. Solana programs, otherwise known as smart contracts on other protocols, separate program code from data with an implementation called SeaLevel. This model is different from Ethereum where smart contracts contain both code and data.

On Ethereum instructions from one smart contract can be run one at a time and transactions are processed in a sequential fashion. Solana can achieve much faster results since data can be simultaneously passed as input to programs. This enables many inputs to be sent at once and multiple copies of the program to run in parallel to increase performance. Multiple programs can also be processed at one time.

Everyone on the Same Page

Proof-of-history (POH) is an idea that revolves around the simple agreement of time – essentially trusting a timestamp when receiving a message. This might sound trivial, but it has been an issue for decentralized networks in particular. By centrally producing a publicly verifiable order of events, nodes do not have to check with other nodes to confirm agreement of time and event ordering.

The main protocol assigns every event and transaction a unique code, or hash, and broadcasts the information. It offloads the burden from each validator on the network to calculate a time stamp and centralizes this functionality within the system. Doing so is one of the main reasons for Solana's increased speed and transaction throughput compared to other layer 1s as the heavy lifting and processing of time and order happens separately from validators. Network lag is greatly reduced.

Best Baked in Batches

Transactions on Solana are meant to issue instructions to programs on the protocol. Each program is specialized to perform different functions for the network including for simple activities like transferring SOL. While Solana only has one transaction type, it differs from Ethereum where there are specific transaction types which can only be run sequentially. Each transaction on Solana can hold a bundle of instructions to direct programs to perform actions. Calling different programs that enable different types of functionalities in this way allows Solana to split work and simultaneously instruct many programs at one time.

For instance Solana has a main token program on the protocol where minting, transfers, and burning tokens take place. Accounts are created specifically to interact with a program on the network and can "transact" with the program to execute these actions in parallel, making the network faster.

Around 90% of the Solana network is broken down into mostly external calls to pull in data from outside sources to inform decentralized programs, token transfers, DeFi transactions on the Solana-based Serum DEX, and new accounts information on data and ownership. Additional network activity also consists of consensus activity. At current rates, Solana is processing 2.4k transactions per second which is inclusive of much of the above activity.

High Standards

Anchor is a Rust-based development framework for Solana that provides tools to build on the protocol. It makes working with repetitive tasks and nuances of Solana much easier, a defining quality amongst layer 1s, and is meant to attract many developers. Projects like the popular Serum DeFi platform were built with Anchor. Solana also has a fast runtime platform similar to Ethereum Virtual Machine (EVM) called Low Level Virtual Machine (LLVMs) where programs are run and instructions are executed.

Solana Inflation Schedule
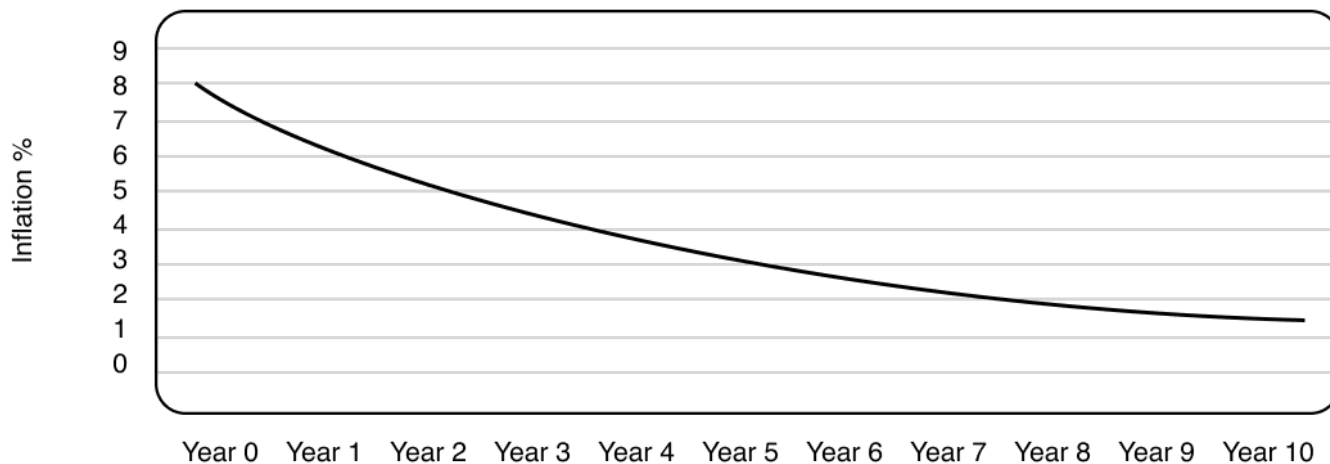
(Figure 3) Solana's Inflation Schedule; Source: Solana Docs

The protocol hosts a vibrant DeFi ecosystem which revolves around the Solana Program Library (SPL) token standard. The protocol has one token standard, SPL, for both fungible and non-fungible (e.g. NFTs) tokens. Wrapped SOL is also on the same SPL standard to facilitate interaction with the rest of the DeFi ecosystem. It can later be unwrapped in a Solana wallet back to the protocol's native token, SOL.

Inflate and Delegate

Solana's network is inflationary, but that inflation rate decreases at a steady rate for the next 10 years. The network supply was set to an initial inflation rate of 8% and coded to target a long-term inflation rate of 1.5% in 15 years. Below is a model of the first 10 year predicted inflation curve with a 15% YoY dis-inflation rate over the same period.

The network's inflation schedule provides an advantage compared to most other layer ones since it creates conditions for network validators to earn around 6% delegating SOL and more than that if individuals run a validator, especially accounting for any network fees validators accrue. Solana focuses on "professional validators" to create a high performance and highly secured network. These types of validators run enterprise grade hardware with extremely fast connections and high uptime/availability. One of the criticisms of the network though is that it may not be as decentralized as other protocols, with fewer number of validators given a preference for higher quality operations and hardware.

From Mobile to Crypto

Team members include Anatoly Yakovenko who is founder and CEO who spent the last 20 years either creating his own VOIP startups or as a software engineer at Qualcomm and Dropbox. Greg Fitzgerald is co-founder, CTO and principal architect at Solana who also spent time most recently at Qualcomm in the Office of the Chief Scientist as a senior staff software engineer. Both focused on building cutting edge mobile platforms and recruited others from Apple and some of their prior firms to launch Solana Labs. The initial team has a mostly technical background which shows the deep consideration they had for how they initially architected the protocol. Like Ethereum, Solana has also established their own group to support their network called the Solana Foundation which provides grants, resources, and discounts on equipment for validators hosting nodes.

Solana Rennaisance

Solana has reached 1.6M followers on Twitter, has a 140k member following on Reddit and a 91k member base on Telegram. People are clearly interested in what the team is doing and what is happening within the ecosystem. New SPL tokens, a measure of new DeFi token issuance and activity taking place on the protocol, has doubled since June of last year. Daily new NFTs on the platform has also grown about 2.5x since. SOL transferred over the network has grown 55% in the same timeframe. Network fees related to protocol activity has also seen 5x growth. Active programs on the network, another measure or proxy for usage, grew by a very similar 5x multiple. The SOL token price also reached an all time high in November touching $258.93.

Risks, but Worth the Reward

On September 14th the network was flooded by a deluge of transactions from bots, overloading validators and crashing the network for 17 hours. Uptime is the most valuable statistic for any global network and if Solana aims to be one of the main layer 1 protocols, it must be accessible nearly all of the time (as an example, AWS has 99.9% uptime service level agreements). There are also 10x as many DApps built on Ethereum. If the protocol wants to establish itself as the Ethereum killer, or at least make significant inroads, it must outpace Ethereum's ecosystem growth. Additionally the network must attract a similar contingent of developers to produce these dApps.

Also in the recent Wormhole hack, hackers exploited a bug in a protocol that bridges Ethereum to Solana. An attacker was able to mint wrapped ETH on Solana's network that was not backed by deposits and bridged ~94k ETH to Ethereum, ultimately withdrawing the exploited proceeds. While it wasn't a direct bug in Solana's protocol, the Wormhole network was exploited which interacted directly with Solana. Bridging risk remains significantly high and will continue to, as exploits like the Wormhole hack remain in the collective crypto conscious for the long term.

Due to the nature of bundling many instructions, transfers, and consensus votes in individual transactions, it becomes harder for network participants to have a view into the real economic statistics of transaction flows and value moving through the network. While the network is seemingly transparent at first glance with statistics of transaction speeds and counts, network explorers would benefit from separating monetary transaction flows or providing an easy way to pull this data from the blockchain.

The Investment Case for Layer 1s: Big Value in the New Internet

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Ethereum: Merging Into a New Era

PM Notes:

1. We see 82% upside in our Base Case target of $5,382 using a trailing network value to transaction (NVT) multiple of 49x and 60% year over year (YoY) transaction growth.

2. Our Bull Case shows 184% upside at $8,347 at the same 49x multiple, while our Bear Case highlights a scenario where other L1s begin to dominate and total value locked (TVL) in Ethereum drops to sub 25% limiting upside at $3,900 or 33%.

3. HODLing pays the HODLers – Ethereum will fall into net deflationary territory by 2.25% as we estimate a higher burn rate than issuance, bolstering ETH's value at the network level.

4. Optimistic about the Future – Zk and Optimistic Rollups like Arbitum and Optimism will be pillars of growth as layer 2 solutions. They'll help expand network activity clearing the way for less friction and more transaction throughput while still maintaining security.

5. Transaction Renaissance – Get ready for fast, 100k transactions per second (TPS) fast. Spreading the work, shards split the network load into pieces processed in parallel as opposed to handling it in a linear fashion. Part of Phase II of the consensus layer rollout, sharding will be a reality sometime in 2023.

Model Assumptions

We assume a Q3 2022 go-live for ETH's consensus layer. In our network issuance/staking calculations, we also assume 98% of validators are online and project that staked ETH continues on the same, linear upward trajectory until the merge occurs in Q3 2022.

In all our cases, we consider inflation in a proof-of-work (PoW) regime which includes a moderate net inflation rate of 1.25%, an issuance rate of 4.18% and a burn rate of 2.93% due to EIP-1559. After the merge, we

Category: Layer 1 Protocol

ETH/USD: 2,942

BTC/ETH: .0744

https://ethereum.org/

Ethereum Block Explorer

Consensus Mechanism:

Byzantine Fault Tolerance (BFT)

Validator Selection Mechanism:
Proof-of-Work

(Q3 2022 Proof-of-Stake)

Staking Yield: 4.4% APR

Circulating Token Supply:
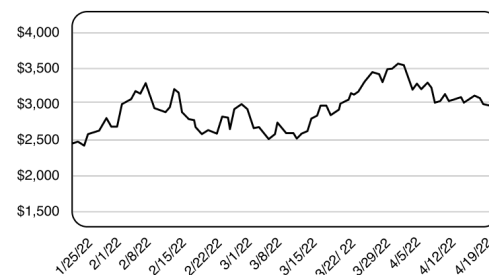120,513,044 ETH

Locked Token Supply: 38.85M ETH

Fully Diluted Tokens: N/A

US$ Circulating Market Cap:
$354.60Bn

Crypto Market Cap Rank #: 2

ETH 90 Day Price

assume net inflation to be -2.28%. Current transaction growth trajectories of 61% YoY are maintained in the base case, while they 2x in the bull case and 1/2 in the bear case. We also assume an ETH consensus layer Phase 1 go-live in Q3 2022 and adjust network issuance based on predicted staked ETH at that time in line with network economics.

INVESTMENT THESIS

ETH has a 90 day average NVT ratio of 49 which is in line or better than other comparable networks in the layer 1 ecosystem and may be undervalued comparatively given future upgrades. We think that the network will continue to be a beneficiary of new decentralized applications (dApps) and transaction growth especially as the network upgrades over time and barriers to entry / friction are mitigated.

NVT = Market Capitalization ($)/Transaction Volume ($); Ethereum Circ. Mkt Cap ≈$354.60Bn

	ETH	DOT	SOL	BTC	AVAX	ADA
Tx Daily Volume ($)	2.39Bn	61.24M	367.70M	28.18Bn	28.34Bn	15.30Bn
Tx 90 Day Avg Volume ($)	5.87Bn	164.87M	608.59M	16.00Bn	19.60Bn	30.97Bn
NVT (Daily)	148.63	293.84	90.89	26.71	.68	1.4
NVT (90 Day Trailing Avg)	49.14	89.13	54.92	53.10	.99	2.05
FD NVT	49.14	122.52	84.12	52.02	1.46	1.29
Circ. Market Cap ($)	354.60Bn	18.05Bn	33.42Bn	752.67Bn	19.39Bn	29.94Bn
FD Market Cap ($)	354.60Bn	20.20Bn	51.20Bn	831.85Bn	28.60Bn	39.96Bn

(Figure 1) Comparable L1s – NVT Multiples; Source: Coin Metrics, CoinMarketCap, Osprey Funds; Tx = Transaction, FD = Fully Diluted

Base Case – $5,382: In our base case, we see upside of 184% using a trailing NVT 49x, 60%YoY transaction growth and assume ETH consensus layer Phase 1 activation in Q3 2022. We also anticipate the network falling into slightly deflationary territory by -2.28%. Phase 1 is when proof-of-work ceases and proof-of-stake begins when Ethereum Mainnet merges with the Beacon Chain.

Ethereum-reliant finance, gaming and non-fungible token (NFT) dApps like Uniswap, Axie Infinity/Decentraland and OpenSea and SuperRare are at an advantage since users will benefit from faster on-chain transaction execution times and lower gas fees which will incentivize the use of the networks where Ethereum already holds a majority of the market share. Popular future applications of the web3 backbone and interfaces are built on Ethereum such as Metamask, Brave, and Ethereum Name Service must support speed at the largest scale in the crypto universe. These dApps must support user growth numbers like the 70M addresses already on the network and 60% YoY growth as a starting point for a future user base.

1. Sharding Forward: Sharding adds to Ethereum's ability to scale and will lead to more participation and the ability to spread processing over a wider network. The concept sub-divides the network to process network activity in smaller chunks in parallel instead of in a linear fashion. This dramatically speeds up transaction processing times by many multiples and significantly lowers the barrier for validators to join the network. Version 1 of sharding implementation also decreases the data that validators will need to store, only requiring validators to store data specific to their shard and not the entire network. This is where real speed benefits are realized.

   Sharding will be released in a series of different versions, but there is still debate on the subject on whether

code will be executed on the shard chains. TBD on this but the ultimate difference is that even at version 1, 64 shard chains will provide at least a ~6600x greater transaction throughput (10 to 15 TPS ☐ 100K TPS). What really matters is the ability for individuals anywhere with a laptop or mobile device to eventually participate by running clients for sharding. This is a powerful concept, and if properly executed, will make Ethereum even more secure, decentralized and significantly faster with lower barriers to entry.

2. Future is Looking to Layer 2s: Sharding will work in conjunction with scaling solutions like ZK and Optimistic rollups. While sharding exists at the layer 1 level, layer 2 solutions also seek to expand network capacity by providing additional speedways via added chains. Layer 2s are simply chains where value is transacted separate from the layer 1 execution layer but settled on the main chain once transactions are netted. This decreases the processing load on the execution level by cutting down the number of transactions while higher level 2 chains are freed to transact network activity. It is a specialization of work split between separate but interconnected chains. When sharding is combined on the main chain with layer 2 solutions, the network becomes even faster and more usable to support hyper growth of users and transactions on the network, especially if Ethereum becomes the go-to web3 protocol.

ZK and Optimistic rollups have their pros and cons, and each have their process of proving whether transactions are fraudulent or legitimate. Over time, maybe a preferred method of transactions will reign supreme, but both are solving Ethereum scalability constraints ultimately to ease congestion on the layer 1 execution chain for frictionless speed. Optimism, Arbitum and Immutable-X are popular examples of layer 2 scaling solutions.

Bull Case - $8,347: In this scenario, we see upside of 184% while Ethereum continues to grow as the number one decentralized finance (DeFi) chain three years from now as the overall crypto industry pie grows along with it. We see transactions growing by double our base case, at 120% YoY with an NVT of 49x, as gaming, finance, collectible, and technology applications continue to be built using Ethereum as the main network. While in our bull case, there is the possibility for a multichain world, Ethereum will hold the lions share of transaction volume, own a large portion of development activity, and sets the industry gold standard. In our bull case, Ethereum further solidifies development as the main backbone of the next generation internet. In this case we see sharding fully activated and functional fulfilling the theoretical 100k TPS prediction.

Bear Case - $3,900: In this case, we see other layer 1 solutions like Polkadot and its parachain offering eating into Ethereum's market share. We assume a continued downtrend in Ethereum DeFi total value locked (TVL) dominance to sub 25% and transactions on the network still growing, albeit at a 50% slower rate than our base case rate at around 30% YoY growth with a 49x NVT. Upside is still 33% as the ecosystem grows, so will Ethereum's competition with layer 1 networks like Solana and Avalanche with capture GameFi and institutional finance dApp market share.

Deflation Forecast

Staked ETH is the driver of network issuance tokenomics in the new consensus layer. See Figure 2 below which shows the relationship between staked ETH, network issuance and validator return rate at each level of staked ETH.

Validating ETH, Inflation, and Validator Return Rate ETH Consensus Layer
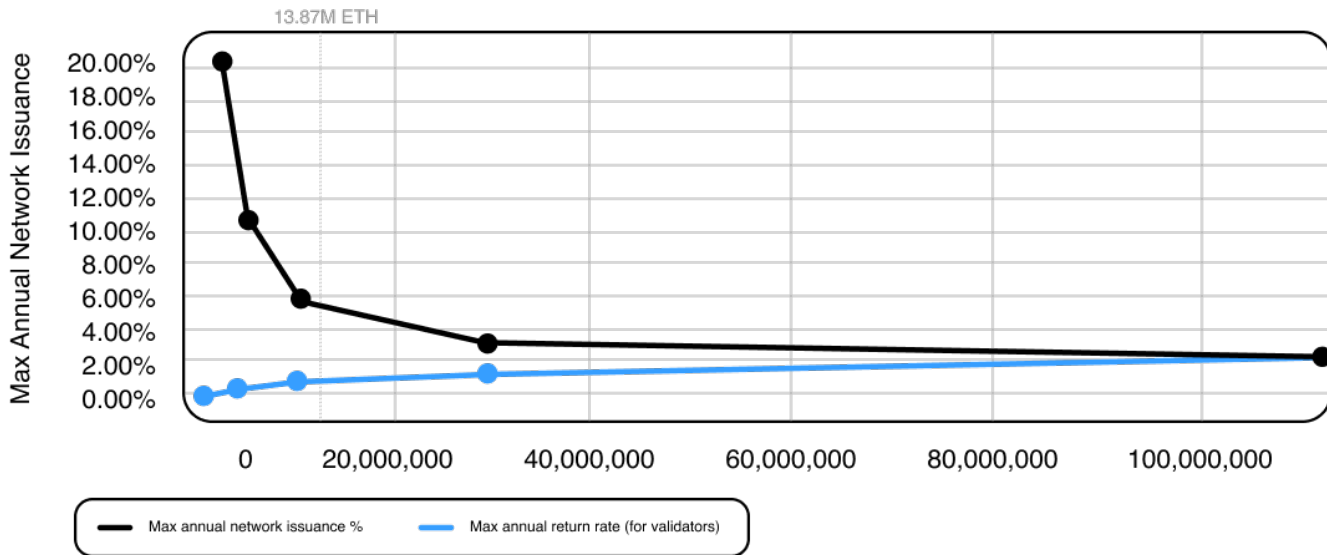
(Figure 2) Validating ETH Consensus Layer; Source: Ethereum Docs

We've also projected staked ETH amounts based on the current trajectory and determined the value should be around 13.87M staked ETH by that time. According to the staked ETH to network issuance relationship, this puts the future ETH proof-of-stake max issuance rate at around .6%.

Staked ETH on Consensus Layer - Current and Forecasted
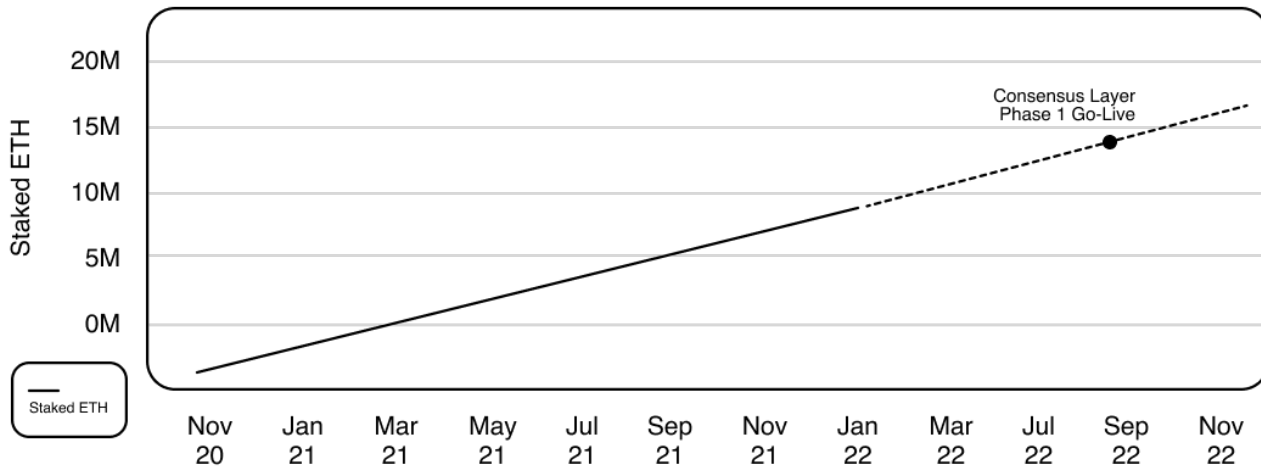
(Figure 3) Staked ETH on Consensus Layer; Source: Ethereum Docs, Osprey Funds

Month	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Apr 23
ETH (M)	11.98	12.61	13.24	13.87	14.50	15.14	15.77	16.40	17.03	17.66	18.29

(Figure 4) Projected Staked ETH after the Consensus Layer Phase 1 Goes Live; Source: Osprey Funds

But wait, doesn't that mean ETH is slightly inflationary? Nope. Not when we included the average burn rate, which is dependent on transaction activity on the network. If you consider the average burn rate at current transaction levels, it reveals that ETH proof-of-stake may very well become deflationary by about 2.25%. We found that the deflationary aspects are indirectly accretive to long term token holders and the network overall – HODLing essentially pays the HODLers. It pushes up price targets a bit in an ETH proof-of-stake world vs. without activation.

DEEP DIVE: AN INITIATION ON ETHEREUM

Ethereum is the behemoth of layer 1 protocols. There's no denying its influence, domination, and longevity as the most widely used smart contract network in crypto and web3, and by a wide margin. Here are some stats – it currently makes up almost 1/5th of the crypto market by circulating market capitalization and is second to only Bitcoin. 90 day active addresses and new funded addresses on the network have grown by 50% YoY since 2020. Perhaps most notably, the number of addresses with a non-zero balance have grown 6x since 2020.

Some could argue it has already won the protocol war and achieved the adoption it needs to continue its dominance into the future. While there are still other layer 1s competing for a shiny #1 web3 trophy, ETH is still the heavyweight champion. It will be hard to unseat while challengers make attempted inroads at additional market share.

Maybe you've been hearing a lot about Ethereum's planned roadmap over the years, implementation schedules, delays etc. We have laid the latest out below so you can see for yourself – it is closer now than it ever has been and has the potential to enter another era by Q3 2022:

Ethereum Serenity Upgrade

- Phase 0 – Beacon Chain Staking – this is the proof-of-stake blockchain that currently went live in 2020 and is operating separate from the Ethereum network. Validators are currently staking ETH to participate in the chain. You must have at least 32 ETH to stake, but it will be locked up until after the network merges with the proof-of-work chain when functionality is implemented to withdraw staked ETH. No date has been confirmed as to when participants can unstake.

- Phase 1 – proof-of-stake implementation where the Beacon chain is merged with Ethereum mainnet, the current proof-of-work chain by Q3 2022.

- Phase 2 – sharding will be implemented sometime in 2023, which will split the network into 64 chains and enable network activity to be processed in parallel. Doing so will potentially enable the network to reach 100k TPS.

TECHNICAL FEATURES / NETWORK DESIGN

Feel the Burn – EIP 1559

EIP 1559 is an Ethereum upgrade that was launched on August 4, 2021 which was developed to improve on the Ethereum fee system while transacting on the network. Prior to the upgrade, transaction fees were unpredictable, volatile and in many cases, users would end up overpaying by multiples over what they could have paid.

1559 creates a predictable relationship between network congestion and the base network fee adjusting as needed – a process automatically set by users' wallets – and saves on transaction costs. Users can adjust a tip amount to send to miners and in the future, to validators, to push their transaction ahead in the queue depending on how

quickly they want it to be processed. Miners/validators get to keep the tips that the user sets, but the base fees are mostly burned by the network.

You can already see EIP 1559 network upgrade in action. In the first three years / early days of ETH, inflation was the highest and averaged 11.3%. While it ultimately settled down to an average yearly rate of 4.36% in the two years leading up to EIP 1559, it was still cut by 72% on average after the burn mechanism was implemented in August 2021. On 14% of the days since activation, negative net inflation has occurred. For instance on January 10, 2022 Ethereum was 1.8% deflationary. We determined network inflation by annualizing daily ETH issuance and subtracting burnt fees.

Prior to the upgrade, the network's monetary policy only incorporated issuance determined by diminishing block rewards over time set in network code. While there were other notable block reward decrease upgrades to the network in the past like the Byzatium fork in 2017 and the Constantinople fork in 2019, there was never an upgrade that included a burn component which actively reduced circulating supply.

Reliably Efficient but Needs a Refresh

EVM (Ethereum Virtual Machine) is the abstraction layer that was built to provide an environment that functions like a distributed virtual computer where smart contracts can be executed and activity is run on the Ethereum network. Solidity is the language that directly enables these types of actions on the network and is EVM-specifics.

EVM and Solidity are the bases of Ethereum and while they've taken Ethereum to its current heights, could be a drag in the long run. Solidity is language specific to EVM and may create unneeded barriers to entry. Other layer 1 solutions like Polkadot utilize WASM which is compatible with most languages like C++ or GO making onramps more accessible for traditional developers moving into a new, crypto-based environment. Code must also be compiled first before it runs on EVM which could slow the speed at which activity can be executed.

Ethereum is looking to implement EWASM, a version of WebAssembly for Ethereum, to lower barriers of entry for new developers while simultaneously cutting execution time compared to the original EVM. EWASM also does away with the need to pre-compile code which will speed throughput while also integrating better with Layer 2 solutions and sharding that will be implemented on the consensus layer. It could be part of the solution that leads Ethereum to cemented layer 1 longevity.

The Original Cast

An ecosystem of thousands of organizations and companies as well as individuals fund, support and participate in the development of Ethereum. The non-profit Ethereum Foundation is one of the original organizations that ensures the protocol and ecosystem has the proper support. The co-founder of Ethereum, Vitalik Buterin, also serves as a board member and is considered by many as one of the original visionaries in the crypto world. Consensys also supports the ecosystem, which was founded in 2015 by Ethereum co-founder Joseph Lubin and is looking to expand to 900 employees in 2022. It is already in 30 countries globally as the company created an array of Ethereum-based products and activity, including MetaMask, a very popular DeFi non-custodial wallet that manages digital assets.

The Ethereum community and team revolve around the Ethereum community hub that connects the wider developer, designer and general enthusiast ecosystem and are ultimately supported by longstanding foundations and companies that have been pushing growth and adoption since launch the protocol's launch.

Caustiously Optimistic About Risk and Challenges

While Ethereum still remains the dominant layer 1 by far, it is simultaneously the target of an ever-evolving ecosystem of competitors to no one's surprise. Many layer 1s, and even layer 2s, are employing EVM compatibility to even the playing field and are vying to gain share from Ethereum's ecosystem by allowing people to interact with the protocol via their own blockchain. A great example of this is Fantom that allows EVM (Ethereum compatible) dApps to be deployed on their network. Fantom asserts that deploying on their network lowers costs vs directly using Ethereum. Evidence can be seen in on-chain TVL dominance. Ethereum accounted for 97% of TVL across DeFi in mid-January 2021. Its dominance has fallen by 43% since, or 2.7% per month on average, and sits around 54% of all DeFi TVL across chains as participants explore other ecosystems.

The industry could see a world in which Ethereum represents under 25% of DeFi TVL a year from now if the trend continues at the same rate. Of course, total TVL can also increase in the meantime where although Ethereum could hold a smaller slice, it will be of a larger pie and still claim TVL dominance.

Layer 2 challenges of scaling may also eventually run into the same issues as the layer 1 execution layer. Solutions like Arbitum and Optimism are separate chains, and while transaction speed is fast at the current point in time, they may ultimately run into the same congestion issues in the long run when transaction throughput increases. Full decentralization after transition to a proof-of-stake network can also be an issue, as large organizations like Coinbase are currently running a large share of validator clients on the Beacon chain prior to go-live.

Other threats may simply be Ethereum's time to fully implement its consensus layer. Development timelines have been delayed multiple times, and while Phase 1 proof-of-stake is being deployed in Q3 2022, it is still possible that it slips into 2023 or it gets pushed again for unforeseen reasons. Industry innovation is happening at a breakneck pace and the possibility exists that people become impatient and begin to use other layer 1 solutions, which may already be happening. Additionally, a deflationary proof-of-stake version of Ethereum may sound enticing at first, but the transition to a tighter supply could shift the network away from an elastic one that serves all types of transactions to monetary system that incentivizes only certain types of transactions going forward. This type of network may take on exaggerated properties of value storage, with a secondary function of processing transactions only when economically feasible.

The Investment Case for Layer 1s: Big Value in the New Internet

APRIL 2022

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Bitcoin: Been Around the Block

PM Notes:

1. We see a 324% upside in our Base Case target of $167,864 using a trailing network value to transaction (NVT) multiple of 53.10.

2. Our Bull Case, without multiple expansion, implies upside of 482% and a price of $230,487. In the Bear Case, we still see upside of 168% with the same NVT and 70% transaction growth for an implied price of $106,111. Reduced retail and institutional enthusiasm weigh on the ecosystem as governments become dismissive and take regulatory action against the digital asset.

3. Living its best life – Bitcoin has remained resilient in the face of a consistent barrage of attempts to declare it not useful, non-functional or dead…instead Bitcoin's motto is YOLO. Since inception, it is a textbook example of the Lindy effect – the longer an idea persists, the longer it will survive.

4. 1 BTC is 1 BTC – Bitcoin has demonstrated its use as a store of value over time and a reliable medium of value transfer. It has a global reach for borderless exchange. The network processes $16Bn daily on an average 90 day interval and has processed $35.5Bn at its peak in November 2021. Growth of daily average transaction values are up 14x, a 1300% increase, since 2019.

5. Sliced – In Q1 2024, another halving will occur which will reduce Bitcoin's block reward by half, further tightening its network inflation.

6. Alternative Universe – Circulating and total supply may not be what you think. In our bonus valuation method, instead of 21M total BTC, we assume 16.3M BTC is all that will ever be mined. In this scenario, we assume the market has not priced in 3.7M lost BTC and 1M BTC of Satoshi's stash that may never make it back into circulation. We find the immediate-term value of one Bitcoin to be $52,556, which is undervalued by 33% when compared to the current price.

Category: Layer 1 Protocol

BTC/USD: 39,569.97

https://bitcoin.org/

Bitcoin Block Explorer

Consensus Mechanism:

Byzantine Fault Tolerance (BFT)

Validator Selection Mechanism:

Proof-of-Work

Staking Yield: N/A

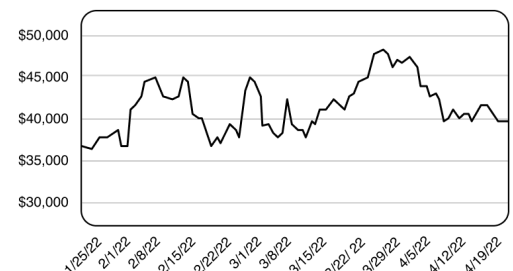**Circulating Token Supply:**

19,021,118 BTC

Locked Token Supply:

N/A

Fully Diluted Tokens:

21M

US$ Circulating Market Cap:

$752.67Bn

Crypto Market Cap Rank #: 1

BTC 90 Day Price

Model Assumptions

In our investment thesis, we assume a 1.76% supply inflation rate until March 2024, where inflation drops to .88% YoY due to the halving. We assume the 2024 Bitcoin halving takes place in March 2024. We also assume a total supply of 21M BTC and a current circulating supply of approximately 19M BTC. Our Bonus Case assumptions for total and circulating supply are different (see section below).

INVESTMENT THESIS

NVT = Market Capitalization ($)/Transaction Volume ($); Bitcoin Circ. Mkt Cap ≈ $752.67Bn

	BTC	DOT	SOL	ETH	AVAX	ADA
Tx Daily Volume ($)	28.18Bn	61.24M	367.70M	2.39Bn	28.34Bn	15.30Bn
Tx 90 Day Avg Volume ($)	16.00Bn	164.87M	608.59M	5.87Bn	19.60Bn	30.97Bn
NVT (Daily)	26.71	293.84	90.89	148.63	.68	1.4
NVT (90 Day Trailing Avg)	53.10	89.13	54.92	49.14	.99	2.05
FD NVT	52.02	122.52	84.12	49.14	1.46	1.29
Circ. Market Cap ($)	752.67Bn	18.05Bn	33.42Bn	354.60Bn	19.39Bn	29.94Bn
FD Market Cap ($)	831.85Bn	20.20Bn	51.20Bn	354.60Bn	28.60Bn	39.96Bn

(Figure 1) Comparable L1s – NVT Multiples; Source: Coin Metrics, CoinMarketCap, Osprey Funds; Tx = Transaction, FD = Fully Diluted

Base Case – $167,864: We find upside of 324% and a price of $167,864 is possible after three years of $USD transaction growth at the current rate of 1.43x. We also consider a network value to transaction (NVT) ratio of 53.10 and factor in the next halving event in 2024 that will temper circulating supply inflation projections.

In three years, we project a circulating market cap of $3.28Tn with a 90 day average transaction volume of $39Bn moving through the network. BTC's comparable 90 day NVT is mostly in line with other layer 1s. We believe the market has formed consensus around Bitcoin as the main network for store of value and density for value transfer that processes anywhere from 175k to 350k transactions per day. Bitcoin deliberately pulls its advantage from not attempting to be like the Ethereums and Solanas of the decentralized finance (DeFi) world. Bitcoin also has a mature multiple in comparison to other L1s, with ~12 years of trading history. As Bitcoin volatility continues to fall, it will attract more capital over time. Separately we estimate that the top global custodians hold about $180Tn. As institutional adoption increases, we conservatively believe Bitcoin can capture a piece of .001% ($18Bn) of these assets.

The protocol has global reach which is evidenced by robust user growth. Active address/wallet counts increasing by 22% year over year (YoY) since June 2018. We continue to see global adoption of the protocol and more usage over time. Terahashes per second, a measurement of mining power dedicated to mining Bitcoins, is at or very close to an all time high. Network participants are willing to invest in equipment and pay the power costs to contribute hashing power to mine Bitcoins. We think this is the ultimate endorsement of the network, as miners are increasingly willing to invest time and money over the long term.

Bitcoin moderates block times and is programmed to target a production of one block every ten minutes. The mining difficulty is adjusted if miners are producing blocks too quickly. Since 2016, mining difficulty has increased by approximately 370x to account for the significant mining power that has come online, dedicated to Bitcoin specifically to keep block production times around the 10 minute mark.

In our base case, we also believe Bitcoin continue additional institutional and retail user adoption as Bitcoin spot ETFs are approved. We think the approval could happen sometime in 2023.

Bull Case – $230,487: In this scenario, we see upside of 482% without multiple expansion as transactions grow at a 50% faster pace over the next three years at 2.15x. The circulating market cap touches $4.5Tn. In this scenario, we see significant institutional adoption, including many pensions and endowments, and Bitcoin captures a larger slice of the .001% of global custodians' assets. We also see heavy adoption of the lightning network.

Bitcoin will become the de facto digital asset to hold as a percentage of an institutional portfolio. In a bull case, governments around the world could ease their stances on Bitcoin, with some declaring Bitcoin as legal tender or even buying it as a reserve asset. While we don't see significant changes in developed governments' viewpoint over the next three years, change can come sooner than we think. In this scenario, accelerated legal and regulatory frameworks accommodative to Bitcoin create certainty for local and global markets and increase adoption rates.

Bear Case – $106,111: In a bear scenario, still without multiple expansion, we see 168% upside at $106,111 in three years based on transactions growing 50% slower than the current rate, or 72%. We project the 90 day average transaction volume in three years to be $39Bn in this case with a circulating market cap of $2.1Tn. While the average transaction volume still grows over a three year period, a culmination of factors external to the Bitcoin ecosystem cause slower growth of the network.

Specifically, Bitcoin spot ETFs are pushed over a three year horizon by unforeseen circumstances and reduce retail and institutional enthusiasm in the Bitcoin ecosystem. Government regulatory frameworks remain uncertain over the next three years, become dismissive and ultimately take legislative action against the digital asset.

A Bonus Case For Immediate Term Value – $52,556:

In our bonus scenario, we look at the current value of Bitcoin in the immediate term and attempt to determine its true value in $USD. In this scenario we specifically look at the circulating and total supplies.

Currently there are 19M Bitcoin that have already been mined, which is 90% of the total supply of 21M. Mining the last 10% will take place over the next 118 years until 2140. Chainalysis estimates that there are 3.7 million Bitcoin that have already been mined that are lost and unrecoverable – forgotten keys, hard drives in garbage dumps or corrupted data – however it happened, these Bitcoins are gone.

There have also been many attempts to identify the total amount of Bitcoin held by Satoshi, the founder of Bitcoin. Multiple estimates land his/her/the group's stash at around 1 million coins. It is possible that these coins will never be moved. Satoshi has yet to move their Bitcoin holdings and while there have been disputes over the true ownership, no one has definitively been able to prove that they own the private key(s) to these coins.

Many Bitcoins were lost in the early days of mining when Bitcoin, a completely new concept at the time, was top of mind and value was an afterthought. While market estimates the total circulating market cap at $752.67Bn, we don't believe it accurately represents the actual circulating supply since it does not take into account Bitcoin that was mined, but will never be accessible. Approximately 20% of the circulating supply that is quoted on popular websites like CoinMarketCap, CoinGecko, etc may not actually be in control of anyone. No one knows for sure, but these are best estimates over the last few years.

Instead we think the circulating supply is somewhere around 14.3M BTC (19,021,118 BTC currently mined – 3.7M lost BTC – 1M Satoshi BTC presumed not accessible = 14,321,118 BTC). We divided the current circulating market cap, $752.67Bn, by the revised circulating supply, 14.3M BTC, that considers lost and forever inaccessible Bitcoin.

We land on $52,556 as the true value of an individual Bitcoin in the immediate term. By this measure, Bitcoin is currently undervalued by 33%. In a fully diluted scenario, we'd arrive at a similar current value for one Bitcoin since total supply and fully diluted market cap scale proportionally. We believe the total supply of Bitcoin, all Bitcoin that will ever be in circulation after mining is complete in 2140, to be 16.3M.

DEEP DIVE: AN INITIATION ON BITCOIN

I'll Take Half

Bitcoin halving cycles decrease the output of Bitcoin for miners approximately every four years. For every 210k blocks that are mined, the block reward is halved. There have been a total of four halving events in Bitcoin's life (2009, 2012, 2016, 2020). Usually after each halving event, we see that the issuance shock causes a delayed effect on the price of Bitcoin 150 and 350 days after a halving event occurs. On each of the halving events, the price has always been higher as a result.

Bitcoin Halving Schedule

| Year	Block Reward	Date
2009	50	Jan 9, 2009
2012	25	Nov 28, 2012
2016	12.5	Jul 8, 2016
2020	6.25	May 11, 2020
2024	3.125	Mar 2, 2024

(Figure 2) Bitcoin Halving Schedule; Source: Various

Bitcoin was designed to target a block time of 10 minutes which means that rewards are distributed to miners every 10 minutes. The network specifically adjusts mining difficulty upward if the algorithm identifies that miners are solving mining problems too quickly. Over the last 7 years, Bitcoin 90 day average block times have been cycling between 9 and 10 minutes caused by variances in network factors. This lowers overall average block times below 10 minutes and slightly decreases the time to each halving. The next halving will approximately occur in the beginning of March 2024; however this could vary slightly as time approaches this date.

We've mapped all relevant halving dates in the past showing prices 150 days and 350 days past the halving event. In every case, Bitcoin's price in $USD has always increased 150 days out from the halving date. Heftier gains are made 350 days out from a halving event and have never dipped below 300% on a +350 day basis. In every case so far, the period after 350 days shows additional price increases that can also be captured.

Note the next halving on approximately March 2, 2024. 150 days after this date is July 30, 2024 and 350 days after is February 15, 2025. We note the dates for reference – certainly nothing is guaranteed; however the idea generally aligns with our base, bull and bear price targets at the end of 2024.

BTC/USD 150 and 350 Days After Each Halving Event
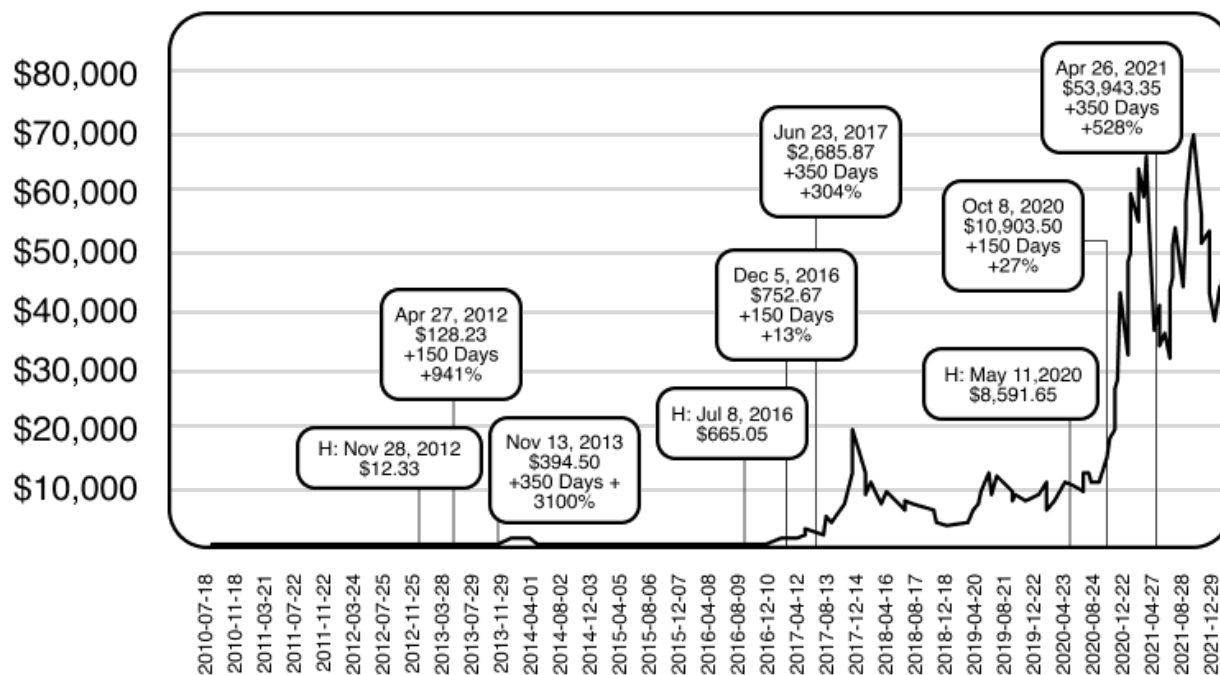
(Figure 3) 150 and 350 Days After Halving; Source: Coin Metrics, Osprey Funds

Hash It Out

We consider Bitcoin to be a layer 1 network, but many of its properties are different when compared to other proof-of-stake competitors. The most obvious is Bitcoin's proof-of-work architecture compared to proof-of-stake consensus for Polkadot, Solana, Avalanche, Cardano and soon-to-be Ethereum this June after its merge. While proof-of-stake does not require nearly as much power to solve for consensus, it rewards large holders of a protocol's native token with more power to decide what decisions occur on the network.

A proof-of-work regime maintains tight security as the protocol is based on cryptographic, hardened SHA-256 algorithm (SHA = Secure Hash Algorithm) technology that requires significant hardware investment to mine more Bitcoin. Due to the pure processing power allocated towards the network, there is a level of security that make transactions on the network nearly immutable since an actor would have to obtain at least 51% of the network processing power to modify transactions. Even then, there are other factors that make these types of attacks less feasible.

Bitcoin processing power for miners, aka hash rate, is measured in terahashes per second. A terahash is 1 trillion hashes per second. The network mining power is at an all time high around 206.85M TH/s. Although TH/s is a measure of security, we believe it also measures conviction, long term belief and a willingness to invest significant sums of capital by large mining institutions and collectives cementing Bitcoin's dominance for some time.

Miners are distributed globally where six main mining pools (i.e. Ant Pool, Poolin, F2Pool, ViaBTC) make up 56% of the hash power to mine Bitcoins. In these pools, the group agrees to share block rewards proportionally to hash power contributed to the group. 44% of the remaining hashpower is from smaller pools, or participants, like companies mining Bitcoin on behalf of themselves, not contributing to a pool's hashpower.

Lightning, On a Chain

The lightning network is a separate layer from the base Bitcoin blockchain. It is a separate, decentralized chain based around the idea that two or more participants can open a payment channel between themselves but not broadcast their transactions to the main Bitcoin blockchain. First, users must deposit funds on the Bitcoin blockchain. Then they can transact on the lightning network if their transactions do not exceed their deposited amount.

As many payments can take place over the lightning network payment channel as desired where the transactions between participants are netted against one another. When the payment channel is closed by all or one of the participants' choosing (there is no time limit), the underlying Bitcoin blockchain is updated with the net transaction number between the participants.

The lightning network makes promises to scale to billions of transactions per second; however we are still in the early stages and will need to wait to see how the technology develops. The lightning network now has enough nodes on the network with a capacity to process $160M worth of Bitcoin.

A Bit(coin) Risky

While Bitcoin brings stability backed by the largest collective mining operations, popularity across the world, and a deep crypto history, the network remains slow on a transaction per second basis. Currently the network is processes transactions at a rate of 2 to 5 transactions per second. This is certainly the slowest layer 1 in comparison to other proof-of-stake competitors by a longshot. While there are ongoing efforts like the Lightning Network, during periods of heavy congestion, the network in its current form may become unusable and take over a day to process certain transactions, similar to what occurred in 2017.

There is also a risk that Bitcoin's technology as the first cryptocurrency, although reliable, will be overtaken by technology that is at least just as stable and faster in the coming years. This is what many networks are trying to accomplish, but so far, Bitcoin's dominance has not been challenged.

Other risks include an unforeseen exploit in the protocol, such as in 2018 when a security researcher found a memory vulnerability that could crash over half of all nodes on the network, including miners. The problem was kept secret until it could be fixed.

The Investment Case for Layer 1s: Big Value in the New Internet

APRIL 2022
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Avalanche: Building Momentum and Gaining Speed

PM Notes:

1. We see 39% upside in Base Case target of $100 using a trailing, but extremely cheap trailing network value to transaction (NVT) multiple of 1x.

2. Our Bull Case, still without multiple expansion, gets us to $136 or 88% upside, while downside risk from competitive pressure and developer flops limit us to $72 for no upside.

3. Re-rating is on the table but not in our numbers. Ethereum trades at 49x NVT, adjust your model accordingly if you think AVAX truly is an ETH killer.

4. The battle is on between Avalanche and Solana to capture share in GameFi. We think gaming is the gateway to true decentralization and the place where "fast" and "cheap" provide real product market fit. Both are winners, but we see bigger share for AVAX.

5. AVAX has asked (with money), and developers have answered (with projects). A new $290M (4M AVAX) incentive program was recently kicked off to build out projects and attract new developers. $10.38Bn total value locked (TVL) also ranks in top 4 in DeFi…people are voting with their crypto.

6. Can I bridge it? Yes you can! We see $30Bn+ careening through Avalanche's network daily. We attribute the Avalanche bridge as a main driver of activity. It is the second largest Ethereum bridge, with TVL at $4.6Bn which allows for the movement of assets between the two protocols. We also credit the launch of Aave's (AAVE) borrow/lend capabilities on Avalanche in October 2021 which made Avalanche Aave's largest market after Ethereum.

7. The Avalanche team is partnering with Wildlife Studios, one of the 10 largest mobile game developers in the world, to launch their own subnet on Avalanche. They're already integrating

Category: Layer 0/1 Protocol

AVAX/USD: $72.10

BTC/AVAX: .00182

https://www.avax.network/

Avalanche Block Explorer

Consensus Mechanism:

Byzantine Fault Tolerance (BFT)

Validator Selection Mechanism:
Proof-of-Stake

Staking Yield: 9% APR

Circulating Token Supply:
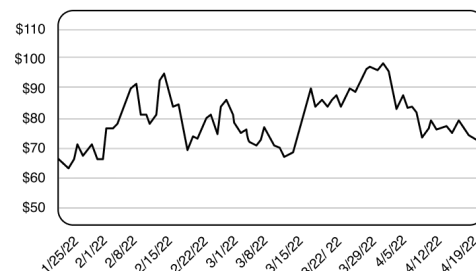
268.6M AVAX

Locked Token Supply:

145M AVAX

Fully Diluted Tokens:

395,891,290 AVAX

US$ Circulating Market Cap:

$19.4Bn

Crypto Market Cap Rank #: 10

AVAX 90 Day Price

custom tokens and NFTs to Castle Crunch, a game with 1M users, to the network. We see huge upside as more chips fall and other large developers in the gaming ecosystem move to the protocol to integrate similar functionality.

Model Assumptions

To reach our forward estimate of circulating supply, we assume that only newly minted tokens serve as validator rewards. Staking rewards are not generated via fees since 100% of network fees are burned. We estimate the inflation rate to be 31.4% in year 1 and 23.88% in year 2 solely as a result of network staking and projecting circulating supply increases. We also consider an initial reward to project founders, creators, and other close parties – the genesis reward of 320M AVAX – to vest at 14% year over year (YoY) and include this in the circulating supply over time according to the vesting schedule.

Given the nascent trading histories of Layer 1 blockchains, we feel that it was conservative to only focus on the drivers of transaction value growth and token supply to derive our price targets without adjusting the NVT multiple even though we recognize, particularly in the case of AVAX, that its NVT is relatively cheap compared to our growth assumptions.

Fully diluted market caps are also used for comparison purposes, but we drive our price targets from a forward estimate of circulating value in order to be consistent with both token supply and user demand assumptions within a three year time frame. For adjusted circulating supply, we incorporate validator fees, burned fees, and projected burned fees in our analysis as well as vesting schedules over time where applicable. Supply inflation rates are considered including issuance rates based on current and projected staking rates.

We see incredible potential in AVAX. Avalanche provides a functional backbone while hosting a rich, developing ecosystem, a scalable model to onboard millions of users in the future with advanced primitives to enable any decentralized application (dApp) to transact swiftly with an expanding ecosystem of applications from gaming, decentralized finance (DeFi), non-fungible tokens (NFTs), institutional onramps, and payment infrastructure. Avalanche has elevated the layer 1 competition for fast on-chain settlement to sub 1 second, aka time to finality. It shows in the numbers.

INVESTMENT THESIS

NVT= Market Capitalization ($)/Transaction Volume ($); Avalanche Mkt Cap ≈$19.39Bn

	AVAX	DOT	SOL	ETH	BTC	ADA
Tx Daily Volume ($)	28.34Bn	61.24M	367.70M	2.39Bn	28.18Bn	15.30Bn
Tx 90 Day Avg Volume ($)	19.60Bn	164.87M	608.59M	5.87Bn	16.00Bn	30.97Bn
NVT (Daily)	.68	293.84	90.89	148.63	26.71	1.4
NVT (90 Day Trailing Avg)	.99	89.13	54.92	49.14	53.10	2.05
FD NVT	1.46	122.52	84.12	49.14	52.02	1.29
Circ. Market Cap ($)	19.39Bn	18.05Bn	33.42Bn	354.60Bn	752.67Bn	29.94Bn
FD Market Cap ($)	28.60Bn	20.20Bn	51.20Bn	354.60Bn	831.85Bn	39.96Bn

(Figure 1) Comparable L1s – NVT Multiples; Source: Coin Metrics, CoinMarketCap, Osprey Funds; Tx = Transaction, FD = Fully Diluted

Base Case – $100: We assume transaction value growth of 60% a year over the next three years implies $100 AVAX price using a highly discounted current NVT of 1x. Compare ETH at ~49x and should AVAX transition from a speculative to established ecosystem, the 50x valuation gap is sure to close, making our targets look ultra-conservative.

The ecosystem is growing quickly and attracting high level gaming developers and institutions due in part due to Avalanche's recently launched incentive funds to attract developers. Developers are building and staying when they see dApp performance. We view this as bullish for the protocol and signals that the market is undervaluing economic activity taking place on the chain. Our major drivers for growth are:

1. Developer base, and users, will grow due to subnets - Developers will flock to Avalanche, especially for gaming, as subnets provide a faster experience for end users where millisecond latency matters. As developer numbers grow, so will dApp offerings and user base. Project creators can fully customize the mechanics and scale networks to millions of users. Subnets are in the beginning phases / use cases and can scale multiple sub-networks in parallel without implications from a speed perspective since they ringfence traffic from the main network. They create a scale-by-unit model by localizing traffic to keep congestion on the mainnet to a minimum for smaller use cases. New games like Crabada and DeFi Kingdom that have moved to subnets and future applications for DeFi, privacy and storage are all potential candidates for their own.

   Crabada is a play-to-earn game that expects users to also save on 85% of the costs simply by moving off the main chain. This leaves essentially unlimited slack in the uptake of the subnets since each one is able to process 4500+ TPS. New incentive programs like Avalanche's recent $290M Multiverse program dedicated to growing the ecosystem and bolstering the growth of subnets will also spark continued growth in an already quickly expanding ecosystem.

2. GameFi – We view Solana and Avalanche as layer 1 competitors in the GameFi space, as Avalanche grows with the market with a fast, cheap and customizable network at its base. The GameFi pie is large and growing. Estimates project the total addressable market (TAM) for gaming at $335Bn over the next five years. In our base scenario, we believe Avalanche can capture similar value to its layer 1 competitor, Solana, over the next three years. The Avalanche team is partnering with Wildlife Studios, one of the 10 largest mobile game developers in the world, to launch their own subnet on Avalanche. Castle Crush will be the first Wildlife game to integrate Avalanche-based NFTs and tokens in June that can be earned, minted, traded, etc. The game already has 1M monthly players and is part of the $290M Avalanche Multiverse effort in addition to many other games.

3. Institutionalizing DeFi Liquidity – Ava Labs, core developers of the network, are partnering with organizations like Golden Tree Asset Management and Jump Crypto to build an institutional-focused DeFi ecosystem that will utilize Avalanche subnets. The solution will also include know your customer (KYC) rules to make the offering more institutional friendly. If Avalanche can attract larger pools of capital to the protocol, economic value that reflects in demand for the network's token should follow. Also BENQI, the first Avalanche dApp to reach $1Bn in TVL, was launched as a liquidity protocol for lending, borrowing and earning. It has seen tremendous growth since 2021 and is now at $2.2Bn in TVL. These are promising developments that we believe set the stage for strong future demand.

Bull Case – $136: We see 88% upside in a more bullish scenario where transactions are growing at a faster clip of 100% YoY with a network value to transaction multiple of 1x, we see $136 as plausible. In this scenario, Avalanche becomes the de facto choice for institutional DeFi liquidity and play-to-earn games. In this case the GameFi market also grows more than expected by surpassing its expected TAM. The protocol becomes a stronghold for capital

allocation. Successful subnet projects are plentiful and scale in parallel. Large gaming houses like Wildlife Studios and other significant application developers are attracted to the protocol and rely on Avalanche to build many of their new projects, or even port other successful applications to the protocol.

Bear Case – $72: We see no upside at a price of $72 in the bear case without multiple expansion, as network growth could slow over the next three years as Solana and other layer 1s capture additional market share edging out Avalanche as a strong layer 1 contender. In this scenario, transaction growth slows to 30% YoY and we see the protocol failing to attract a critical mass of projects, especially in the subnet space. Projects may have trouble attracting validators to their larger projects to support custom networks. Growth is hindered as a result and will directly affect the amount of $USD transacted at the base layer, and ultimately the network value.

Considerations

All cases consider that 100% of fees are burned for every transaction and for other types of network activity such as launches of a new blockchains within the ecosystem (see subnet discussion below). 100% burn of transaction fees is specific to Avalanche and works to balance the network's circulating supply since the network is net inflationary, which we've projected to be 31.4% next year and 23.9% the following year.

AVAX Projected Burned Fees
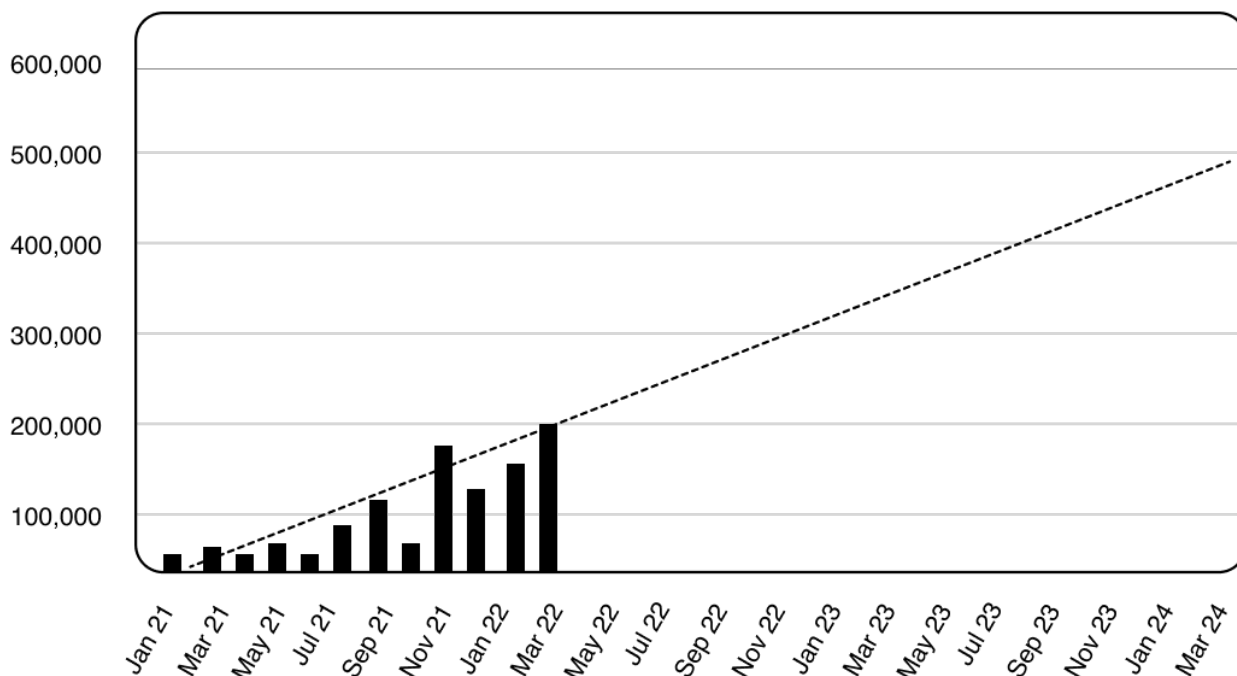
(Figure 2) AVAX Projected Burned Fees; Source: Avascan, Osprey Funds

We've also factored in the genesis release and vesting periods for the initial release of 320M AVAX to original network participants, including founders, investors, public sales and foundations specific to the support of the Avalanche ecosystem over the long term. Staking rewards were projected over time and factored in as they are the only source of new token supply for the protocol. This is also a trait unique to the network from a supply perspective considering all fees are burned and not distributed to validators like in other networks, such as Ethereum.

DEEP DIVE: AN INITIATION ON AVALANCHE

Let's Dive In

Ease of development and deployment for builders of new projects on Avalanche is competitive amongst other layer 1s. Avalanche uses an instance of Ethereum's virtual machine (EVM) to run DeFi chain activity. It provides the best of both worlds, as developers can jump in and create new dApps with the Ethereum-compatible smart contract language, Solidity, while taking advantage of AVAX's specific primitives which speed transaction throughput and bifurcate the chain into scalable parts. Deployment of subnets and new ecosystems is a process that takes under ten minutes so developers can spend more time on the functionality of the application they're building. While the chain competes for developers in the space, over time it is very feasible that more developers will migrate from Ethereum and other layer 1s to build on Avalanche with its subnet functionality, gaming, and institutional focus. The growth of the dApp ecosystem is already strong and shows a rotation into building on the protocol – growth in the number of on-chain transactions has shown a 360x increase and has breached 1M per day. This is an average of 80-90% of Ethereum's count over the last few months.

The Genesis

On September 21st Avalanche's official mainnet was launched. The network released 360m tokens at launch, however slightly over 1/3 of the supply will continue to vest over time until the latter half of 2030. There are currently only 266m in circulation with an ultimate capped supply of 720m and the remainder to be released mostly over the next two decades. The genesis release of the 360M AVAX network supply went to the Avalanche Foundation, team members, community, development uses, and public / private sales. The founders and team members building the chain have voluntarily locked their assets for four years after mainnet launch which aligns the protocol growth to the original developers over a longer time horizon. The Avalanche Foundation earmarked supply from the genesis release vests over 10 years which also aligns incentives in the long term to boost community initiatives.

AVAX Genesis Vesting - 2022 to 2024
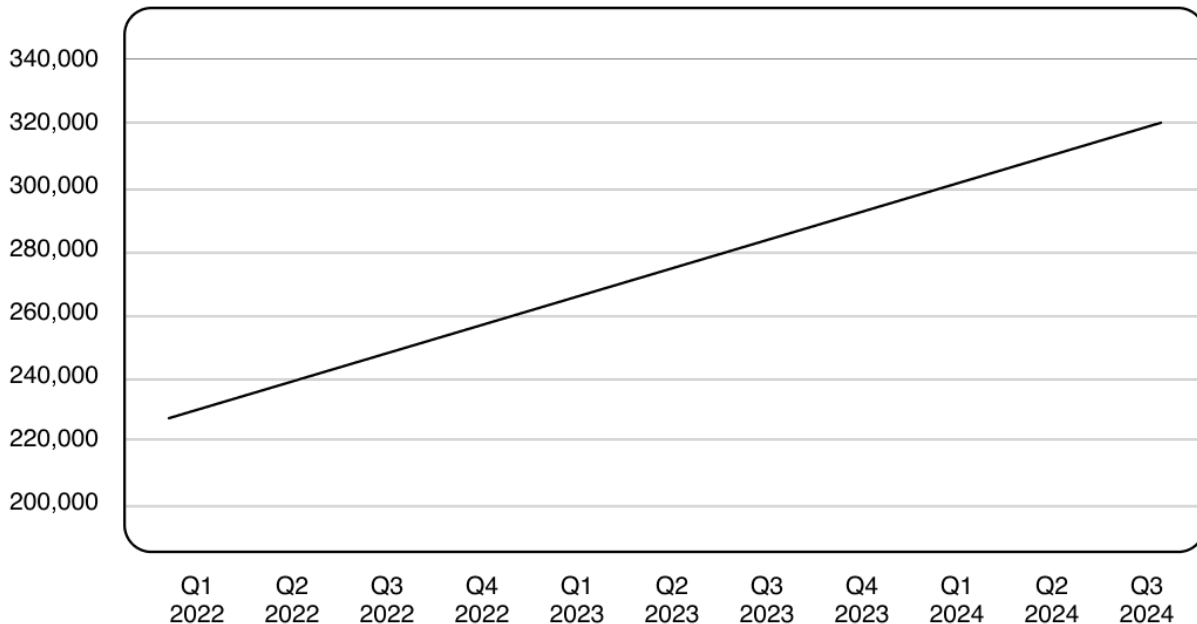
(Figure 3) AVAX Genesis Vesting – 2022 to 2024; Source: Avascan, Osprey Funds

Subnets At Scale

Subnets are an entirely new primitive specific to the Avalanche ecosystem. Subnets are application-specific chains that ringfence traffic. As projects grow, they can be offloaded from the main protocol to a dedicated subnet to ring-fence traffic from the wider network, lowering fees and transaction times. They create a scale-by-unit model by localizing traffic to keep congestion on the mainnet to a minimum for smaller use cases. Larger projects can completely customize their chain with its own validator network, virtual machine, tokens, monetary system, privacy, and other settings.

Subnets are a group of validators that focus on consensus for a particular sub-chain in the overall Avalanche network. They are primitives in the Avalanche ecosystem that allow for the creation of sub-blockchains. It differentiates itself from other layer 1 network architectures by allowing validators to focus on specific applications. These sub-nets are a bit like layer 2 chains in the Ethereum world (think Arbitrum and Optimism) but instead of offloading traffic on the main network with separate validators, they create separate sub-networks branched off of the main chain. A validator must validate the main network but can also choose to opt into validating a particular subnet.

Speed at scale is the ultimate result for the protocol which is something that other layer 1s may find challenging as they continue to grow their user bases to Web2-type levels in the future (i.e. hundreds of millions of users). Avalanche decreases friction for developers so subnets can be deployed quickly. Fast deployment time for entirely new ecosystems allow creators to focus on individual tokenomics, custom network primitives, incentives and user growth as opposed to nuanced development.

Ethereum layer 2 functionality is not inherently built into the base-layer protocol for ease of creation once layer 2 limits are reached. Ethereum layer 2 chains will eventually become congested if the Ethereum ecosystem continues to grow since the same layer 1 congestion limits apply. Avalanche plans for this type of organic growth by allowing subnets with different groups of validators to focus on processing activity for individual chains.

Validators are dedicated to achieving consensus on each sub-chain reducing congestion on the overall DeFi C-Chain. This architecture can continuously scale, creating a scale-by-unit model and processing network activity in parallel as more subnets come online. Each subnet of validators also has control over the membership at the time of sub-chain creation, so validators performing the consensus can be tailored/admitted to the group for each use case while also selectivity opting in to validate specific subnets.

Private sub-nets can also be created that don't broadcast public contents of a specific blockchain or transactions to other nodes. While there are blockchains that specifically address privacy, Avalanche includes an optional solution core to the protocol to address the issue, perhaps even taking market share from networks built as a privacy-first protocol.

Apps for the Future

One popular application on the network currently is a play-to-earn and completely decentralized game called Crabada, a treasure-lootin' experience where gamers play as a crab and try to avoid laser attacks and rockets fired their way. Save your crabcakes because you can count on gameplay to be as realistic as it gets on the ocean floor. Crabada has recently moved to its own subnet and off the main chain, which directly lowers network fees for all. This is a good example of an application currently consuming 16% of network gas to move to its own subnet and offload the burden from the mainnet.

Crabada users will pay much lower transactional fees since it will exist as its own blockchain within the Avalanche ecosystem supported by dedicated validators. The team is targeting a 85% reduction in operational costs for players in the ecosystem. It also affects the main Avalanche chain by lowering fees for anyone not using the Crabada application and decreasing congestion on the mainnet. It's a great example of subnet usage in action simultaneously benefitting the wider network and the individual dApp.

Big News for Everyone

Avalanche is also partnering with one of the 10 largest mobile game developers in the world, Wildlife Studios, to launch their own subnet on Avalanche. Castle Crush will be the first Wildlife game to integrate Avalanche-based NFTs and tokens in June that can be earned, minted, traded, etc. The game already has 1M monthly players and is part of the $290M Avalanche Multiverse effort to jumpstart the subnet ecosystem. While subnets are not for every project, they will provide a large benefit initially to larger projects to retain network speed while not affecting the wider Avalanche network. It is all about keeping the transactional flow moving, little to no friction, low fees, and the network stable. Subnets should disappear into the background while providing these simple but critical benefits that will allow large projects to scale their user bases quickly and exponentially.

BENQI, as mentioned in our investment thesis, is the first Avalanche dApp to reach $1Bn in TVL, was launched as a liquidity protocol for lending, borrowing and earning. It has seen tremendous growth since 2021 and is now at $1.5Bn in TVL.

Separately Ava Labs, core developers of the network, are partnering with organizations like Golden Tree Asset Management, and Jump Crypto to build an institutional focused DeFi ecosystem using Avalanche subnets.

Trader Joe is the most popular decentralized exchange (DEX) on the network and is responsible, along with Crabada, with much of the network activity that currently takes place on Avalanche. Trader Joe's closest competitor to an on-chain DEX is Pangolin, but it only makes up 10% of trading volume.

**Something for All Occasions**

Avalanche network is divided into three separate chains that are interconnected and each serve a specific purpose by splitting the types of transactions they process. Each chain is specialized to perform specific purposes and is built with the function in mind. This makes each specialization faster than a one-size-fits-all processing model seen on other chains like Ethereum, an important differentiator.

The C-Chain, which is by far the largest chain in the ecosystem by transactional activity, provides the ability to generate smart contracts by running an instance of Ethereum Virtual Machine (EVM). Unique addresses on C-Chain has grown just slightly… at 80x YoY. C-chain transaction counts have increased about 77x since August 2021 and has been on a consistent uptrend. This chain is the DeFi-specfic world in the Avalanche ecosystem – you can also interact with it via Defi wallets that support Ethereum. The C-Chain is also a wider example of how competing layer 1s to Ethereum are integrating EVM compatibility to migrate other DeFi users to their own chain

The network's bridge to Ethereum also totals ~$4.6Bn and ranks as the second largest Eth bridge. 95% of assets locked are wrapped ETH, wrapped BTC, and $USD stablecoins to facilitate DeFi activity on the C-Chain. Curve and Aave's protocols also contributes to market making, borrowing and lending activity on the network and are a

C-Chain Transaction Growth
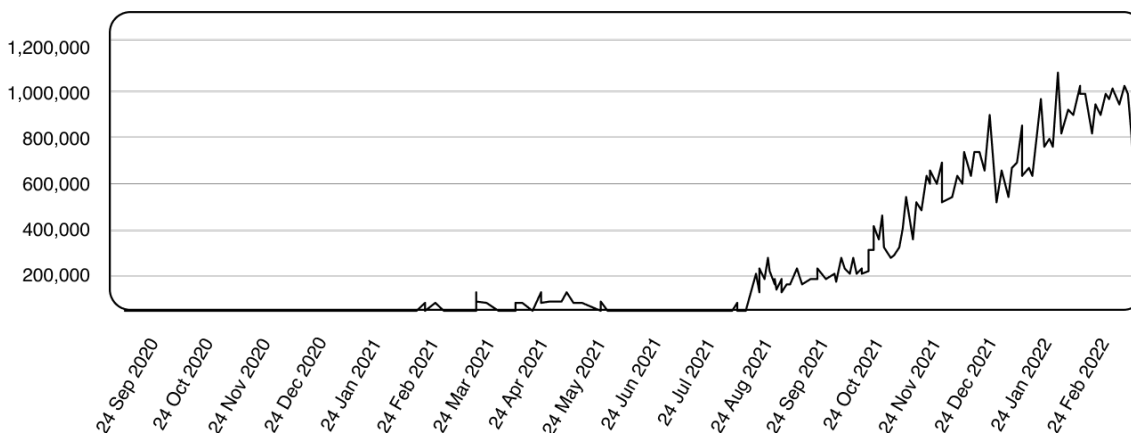
(Figure 4) C-Chain Transaction Growth; Source: Avascan

large driver of activity.

The P-Chain contains all metadata, serves as the consensus coordinator for validators and remains the source to create additional blockchains on Avalanche. Think of this chain as the network quarterback, except it won't retire and then unretire. The X-Chain contains all transactions having to do with sending and receiving funds and the creation of digital assets –
it provides basic but critical functionality. The difference is that it has fixed network fees, unlike the DeFi-based C chain where transaction fees vary depending on network congestion and has a very transaction-specific architecture.

Smashing Node Barriers

The network provides an easy validator onramp to the network. Validators don't have nearly as high upfront hardware costs as other layer 1 networks. Barriers to entry to support the network are much lower than competing layer 1s and provide a higher APR of 9%. A computer with outlined specifications is likely sitting in many people's homes today, including home internet connections that meet the required throughput for interacting with the network. While hardware requirements are low, staking requirements for validators may be a prohibitive factor to host a full node since 2000 AVAX (~$144k) is currently required for running a validating. 2000 AVAX + low hardware costs, however, is still a desirable setup for individuals or organizations seeking to become network validator.

A node becomes a validator by making a single transaction from a wallet. Once the transaction is made, other wallets on the network can delegate to that node for staking. Delegating to other validators is still the most popular way for individuals to support the network and still earn around 9% APR. Delegating only requires a minimum of 25 AVAX (~$1800), a much more palatable figure while comparing the upfront cost of token lockup to host a full node.

Let's All Agree

Avalanche's network consensus mechanism, Snowball, samples the network quickly for the majority preference amongst validators to agree on transactional activity. The sampling is random. Once the nodes are sufficiently confident, then they reach a decision. This is a quick way of doing things compared to other layer 1s, achieving the same results and allows an advantage of polling the wider network to come to a faster agreement. Time to finality checks in at under a second, so there is no waiting for settlement of on-chain value – critical clarity on agreement

of what was sent, received, etc. is a simple concept but in the early days of blockchain development when fighting for market share, it is a welcomed feature.

Under the Hood

Avalanche also runs Ethereum Virtual Machine (EVM) for compatibility purposes with any application from Ethereum's ecosystem. Implementing EVM into the protocol or including EVM compatibility is a wider strategy among layer 1s. It benefits alternative protocols rather than Ethereum since it enables DeFi activity to migrate to other ecosystems and allows for Ethereum developers who are familiar with Substrate to continue to develop dApps on an alternative chain. In these early years of platform dominance, it is a tool that benefits layer 1s to attract users, developers and community.

The Driving Force

Ava Labs is an organization that was established to support Avalanche's development before its launch. It has grown to over 100 individuals across engineering, marketing, operations, and design to support the ecosystem. The founders include Emin Gün Sirer, an associate professor of computer science from Cornell who focused on peer-to-peer systems. Advisors of Ava Labs include Maureen O'Hara, a professor of Finance from Cornell, and Adam Kravetz who has extensive COO experience across the finance industry.

Avalanche Risk

Validator concentration could be a risk by provider – 65% of validators use Amazon Web Services as a provider for hardware so if there is a global outage, more than 3/5ths of the network consensus mechanism could be interrupted (i.e. finalization of transactions, sends, receives). We don't necessarily think this is something to keep you awake at night – many major internet services are built on AWS, so it wouldn't just be Avalanche's problem if this happened. Other things to consider for blockchain developers using subnets is how to attract validators to a subnet. Each new blockchain will require validators specific to that chain. Incentives from the team building the new chain will be needed to attract validators to their subnet with AVAX and/or in the blockchain's token. It is an added layer for builders and users of Avalanche subnets to consider that is not necessarily a consideration if building on other layer 1 networks.

As more audacious projects are launched on Avalanche, the network could be adversely affected in unintended ways. Due to the recent launch of the second most popular DEX on the protocol, a surge of activity triggered a network bug which and caused activity to grind to a halt. A fixed was subsequently published but users should be aware that similar issues could occur as Avalanche continues to scale and build for the future.

The Investment Case for Layer 1s: Big Value in the New Internet

Cardano: Count by the Epoch

PM Notes:

1. In our Base Case, we use a trailing NVT of 2x and only see upside of 16% where transactions grow at 10% YoY at an implied price of $1.03.

2. In the Bull Case, we see transactions growing slightly faster, but not by much, at 20% using the same NVT for a slightly higher price of $1.21 with upside of 36%. In our Bear Case, we arrive at a price of $0.86 and downside of 3% by using a 2x NVT and no transaction growth due to lagging development and waning community support.

3. Primitive Launch – Smart contracts and custom tokens are now a possibility on the protocol and provide a reason for developers to jump into the deep end if they're looking for additional layer 1 options.

4. Not without deep thought – Research is at the core of all protocol proposals. Each feature is incubated at academic institutions and reviewed before implementation if the community votes for it.

5. Slow and steady – Cardano's protocol improvement approach is research oriented, is slower and lags other layer 1s in terms of functionality and dApp ecosystem growth as a result. However we can't count out protocol improvements coming down the pipe, methodical development for the long run with a strong community backing to push the protocol forward.

Model Assumptions

We assume a circulating supply inflation rate of 3.84% per year. We also assume that transaction fees distributed are distributed to all pools that created blocks during an epoch. We consider the Cardano hardcap at 45Bn ADA. There is no token burn mechanism built into the network and while there may be a movement to eventually add a burn component to the protocol, it does not currently exist.

Category: Layer 1 Protocol

ADA/USD: .89

BTC/ADA: .00002

https://www.cardano.org

Cardano Blockchain Explorer

Consensus Mechanism:
Byzantine Fault Tolerance (BFT)

Validator Selection Mechanism:
Proof-of-Stake

Staking Yield:
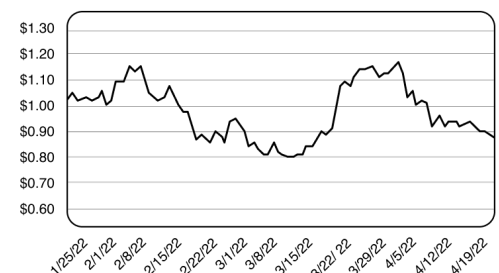5.00% APR

Circulating Token Supply:
33.7Bn ADA

Locked Token Supply: 234M ADA

Fully Diluted Tokens: 45Bn ADA

US$ Circulating Market Cap:
$29.94Bn

Crypto Market Cap Rank #: 9

ADA 90 Day Price

INVESTMENT THESIS

NVT = Market Capitalization ($)/Transaction Volume ($); Cardano Circ. Mkt Cap ≈ $29.94Bn

	ADA	DOT	SOL	ETH	AVAX	BTC
Tx Daily Volume ($)	15.30Bn	61.24M	367.70M	2.39Bn	28.34Bn	28.18Bn
Tx 90 Day Avg Volume ($)	30.97Bn	164.87M	608.59M	5.87Bn	19.60Bn	16.00Bn
NVT (Daily)	1.4	293.84	90.89	148.63	.68	26.71
NVT (90 Day Trailing Avg)	2.05	89.13	54.92	49.14	.99	53.10
FD NVT	1.29	122.52	84.12	49.14	1.46	52.02
Circ. Market Cap ($)	29.94Bn	18.05Bn	33.42Bn	354.60Bn	19.39Bn	752.67Bn
FD Market Cap ($)	39.96Bn	20.20Bn	51.20Bn	354.60Bn	28.60Bn	831.85Bn

(Figure 1) Comparable L1s – NVT Multiples; Source: Coin Metrics, CoinMarketCap, Osprey Funds; Tx = Transaction, FD = Fully Diluted

Base Case – $1.03: In our Base Case, we see transactions growing at 10% YoY and use a trailing NVT of 2x. We see upside of only 16% on an implied price of $1.03. We view Cardano as a protocol that is lagging other layer 1 networks in terms of upgrades and functionality such as smart contracts and custom, native tokens that were just launched last year. While we see active addresses stagnating since around September/October last year, we also see some positive signs of growth like the fact that the network just hit its 4 millionth non-fungible tokens (NFTs) minted.

In our base case, we foresee transaction activity still growing over time but slowing. Total value locked (TVL) also ranks lower at 32nd (compare to Avalanche @ #4) when considering other chains and may be a sign of network woes; however there is currently no compatibility with Ethereum Virtual Machine (EVM) or other protocols. When we combine some of the aforementioned statistics with network value to transaction ratios, we view the consistently low NVTs as a sign that the market is not ascribing a high future value to the protocol mostly due to a lack of dApps and differentiated functionality – circulating and fully diluted market cap are both below the 90 day average value moving through the network.

Decentralized applications (dApps) like CNFT, Cardano's largest NFT platform and first marketplace launched in the summer of last year, are just beginning to build in the ecosystem. While we see promise in marketplaces on the protocol like this, similar offerings on other layer 1s have had longer to develop and grow. First mover advantage is key and the longer it takes protocols to build out an ecosystem, the harder it will be to gain market share. For comparison OpenSea, an Ethereum based NFT marketplace, launched their beta in December 2017. While Cardano may be behind in some areas, we view the protocol's dedicated enterprise focus as part of their strategy to grow the network as positive which can apply to use cases like supply chain tracking, credential verification, and KYC and AML applications for finance.

Other popular dApps include one of the more popular decentralized exchanges (DEXs) on Cardano, Sundaeswap. The 24h volume on the exchange is lower at around $3M. Using volume on the DEX as a proxy for adoption, these types of apps have yet to hit their critical mass (and may never).

Sidechains like Milkomeda, which will be launching very soon, can help with DeFi adoption and interoperability on Cardano, as it will connect the protocol to other layer one networks like Solana, Avalanche and Ethereum and launch it into the DeFi world. It is EVM compatible which we think will be positive overall to capture some of the DeFi market and enable interoperability between disparate networks driving traffic and transactions.

Bull Case – $1.21: In our bull scenario, we use a trailing NVT of 2x and transaction growth of 20% YoY and find upside of 36%. Identity and instant credential dApps like Atala PRISM on the enterprise efforts of Cardano begin to pay off and attract corporate users to the network. The network pushes ahead with transaction speed upgrades in June which attract an important set of new developers to the platform. Trustless light client functionality with new security primitives comes to fruition incubated from Cardano's heavy emphasis on research efforts. The network is in a nascent stage compared to other layer 1s and may have "easy wins" early on which could reflect in a slightly faster growth rate.

Hydra is also a scaling layer two protocol proposed for Cardano that would theoretically push transactions per second (TPS) from the current 250 TPS to 2M by enable concurrent processing. While it is in a proof-of-concept state, if implemented it could provide a huge capacity boost to the network and attract a heftier developer base to the platform. Don't hold your breath though – this is a tall order.

Bear Case – $0.86: In our Bear Case we see 3% downside at a NVT multiple of 2x and no transaction growth if network upgrades don't go as planned and are pushed. We see a case where already lagging development holds the network further behind in ecosystem development. We could see a scenario in which an enthusiastic community still grows the network, but transactions stagnate because of new developers moving to other protocols or not choosing to develop on Cardano in the first place. This would have long run implications for the network. In this scenario, we don't see significant Cardano dApp adoption as other networks will attract users across GameFi like Solana or NFTs on Ethereum.

DEEP DIVE: AN INITIATION ON CARDANO

Cardano is a two layer system split into a settlement/payment layer and computation, smart-contract layer. Cardano recently launched the smart-contract aspect of the network in late Q3 2021. While other layer 1 networks have primitives that are still coming up to speed, many had smart contract capabilities since launch. This has allowed projects in other ecosystems to build for longer periods of time and foster a base of dApps, connectivity and users.

An upgrade to the network in March 2021, the Mary hardfork, was also released that provides users the ability to define custom tokens. This functionality is like creating unique tokens for parachains ecosystems on Polkadot or for subnets on Avalanche, albeit still limited when comparing to depth of customization when designing full ecosystems on other protocols. Since the beginning of February 2021, the Cardano network has seen a large burst in 90 day average transaction activity coinciding with the upgrade by 2.4x YoY to $15Bn.

Jump in and Stake – Water is Luke Warm

Cardano is a proof-of-stake network which Cardano calls the Ouroboruos protocol. Staking pools are the main reward concept that the protocol revolves around. Staking pools offer diminishing rewards based on user/delegator saturation, which are designed to prevent centralization by limiting pool sizes. As more participants join, staking rewards will fall. Pool operators can also optionally pledge ADA – depending on how much they pledge, their pool rewards will be higher. Operators can use this as an incentive to boost the rewards for their pool to make it more attractive to potential delegators.

Ultimately they are rewarded with a slice of network transaction fees and via inflation of the network supply. Operators can also set a price for their service when the configure the pool which they get to keep. The network on the while is designed to reach equilibrium when it approaches 1k active stake pools for decentralization purposes.

Marketing is usually required when first attracting delegators to join staking pools, and while the biggest drivers are node reliability and reward percentage, pool operators are initially instructed to tell their friends and family as part of the marketing strategy as an example. Running a pool quickly becomes like running a business and the

pool is constantly competing with the rest of the nodes on the network to boost staking rewards. To run staking pools, technical knowledge is also required, and operators must be familiar with managing and maintaining servers, backups, etc.

While there are no minimum staking requirements as with other layer 1s to run a pool, advertising and equipment costs to run a node are costs pool operators must consider.

Epic Epochs

What is important to know is that Cardano consensus revolves around epochs that span a period of five days. Blocks are produced every 20 seconds within one epoch where stake pools will be randomly selected to produce the next block validate transactions on the network.

An upgrade scheduled for June 2022, the Vasil hardfork, will introduce a concept called pipelining that will decrease block time creation. It will ultimately speed consensus by allocating more of the network's computational power and memory capacity towards the process…a redistribution of sorts.

Phased In

Cardano is broken down into 5 main phases related to the foundation, decentralization, smart contracts, scaling and governance. The decentralization and governance phases are still underway – smart contract functionality has recently been released. Plutus is the smart contract scripting language and utilizes a modified version of the Haskell language. It may be somewhat of a barrier if developers, who aren't familiar with the language, want to jump into the ecosystem and start development. Compare this to WASM on Polkadot which allows for common languages to be used for development and lowers the barriers to entry on the platform.

Iohk and the Team

Cardano was founded by Charles Hoskinson, who was also a co-founder of Ethereum, and Jeremy Wood. Hoskinson left after a dispute with another co-founder Vitalik Buterin and started started IOHK which develops the technology behind Cardano and runs both the Cardano Foundation and Emurgo. The foundation was established to grow the ecosystem and promote the project while Emurgo was started as a commercial-focused entity that concentrates on the enterprise and government aspect of the protocols adoption.

The Cardano Foundation was established as a non-profit and is dedicated to seeing to the proliferation of the network. They work with IOHK and regulators in different jurisdictions, as an example, to achieve the goals of the foundation. Board members include individuals with experience in the legal, regulatory, and the digital asset space to drive adoption.

Pipeline of Ideas – Deep Thinking

Cardano is based on academic research papers to describe new technology proposals that are independently reviewed. The protocol is known for its heavy research component in conjunction with different universities to enhance the protocol over time. Much of the research is published, peer reviewed papers that propose ideas that may eventually make their way into the wider protocol if the community votes to adopt it. Some of the latest research to be proposed is a concept that ultimately pushes wider blockchain adoption via light clients. Blockchain full nodes are data heavy and store all blockchain information. While this is good for security, it is much slower and creates barriers to entry for anyone looking to interact with the protocol.

The paper proposes a way to interact with full nodes using light clients in a trustless manner via special security

proofs. The idea proposed is a new primitive called SNACK proofs (succinct non-interactive argument of chain knowledge). Light clients do not need to store nearly as much data to interact with the protocol, and thus run much faster while doing so. The SNACK proofs would provide a way to interact with full nodes in a trustless way. Light clients that don't make security concessions can be positive for user uptake in Cardano's future, since they run like simple programs on laptops and smartphones and won't require heavy processing and storage.

Keep on the Lookout

Smart contract functionality and custom token creation is very new on the platform, especially when compared to the rest of the layer 1s. New features can encounter issues even if they're thoroughly tested before launch. Issues related to newly released critical network functionality, especially what many would consider layer 1 table stakes, is something all users should be paying attention to.

In addition, pool operators must contend with advertising their staking pools to get it off the ground as opposed to a quick process to spin up some servers and begin. They are initially encouraged to pitch friends and family and pour money into the pool. This process feels inauthentic and similar to a marketing ruse.

While active address count was on the rise in the beginning of 2021, the growth in active addresses has stalled since September/October of 2021 at around 177k. This could be a negative network adoption signal as similar statistics for other L1 networks have been growing during this time. Total value locked (TVL) is also quite low and only ranks 32nd in TVL (compare to Avalanche @ #4) when considering other chains and may be a sign of network woes. Time will tell – count by the epoch.

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