



CoinDesk 2021 Annual Crypto Review

#CoinDeskResearch



Executive Summary

In the following report, we aim to summarize some of the key themes and metrics that mark the year's progress in cryptocurrency markets.

As with all financial assets, market performance is usually the first thing that comes to mind when considering a “year in review.” Bitcoin (BTC) and ether (ETH), the two largest cryptocurrencies, posted gains well in excess of traditional macro assets **gaining 60% and 407%**, respectively. While ether, the native asset of the Ethereum blockchain, still has a way to go before traditional investors begin to form their investment thesis, bitcoin has cemented itself in the minds of all professional investors, as it eclipsed **\$1 trillion in market capitalization** in 2021. What's more, bitcoin also remained uncorrelated with all macro assets, which could make for an interesting value proposition for the asset as managers look to approach their portfolio construction in 2022. That said, bitcoin's correlation with the S&P 500 ticked up in Q4 2021, suggesting that investors are trading bitcoin and equities together as risk-on assets.

Outside of market performance, 2021 was a big year from an **adoption and technological standpoint**. In June, El Salvador announced that bitcoin would become legal tender; this declaration came to fruition in September when a law that stipulated that bitcoin must be accepted as a form of payment everywhere in the country went into effect. With that came multiple **bitcoin purchases by the government**, carried out from the [president's cellphone](#). Meanwhile, a free \$30 worth of bitcoin was sent to Salvadorans who signed up to use Chivo, the country's official bitcoin wallet, and a commitment was made to use the Lightning Network, the commerce layer for Bitcoin (read more here), to enable a more frictionless bitcoin economy. The amount of bitcoin committed to the Lightning Network grew incredibly fast in 2021, injecting renewed life into the **digital cash use case for Bitcoin**.

2021 also marked the year of an important technological upgrade to the Bitcoin protocol known as Taproot ([read more here](#)). Taproot is a bundle of three upgrades that improves network security, privacy and scalability. Taproot is the most significant upgrade to the Bitcoin network since the activation of the block capacity enhancement of [Segregated Witness](#) in 2017. Taproot was a reminder that **Bitcoin is a**

Executive Summary (cont.)

technology that can change in order to improve usability and user experience. Taproot's success going forward will stand in as a demonstration that **Bitcoin can adapt**.

With ether's superior asset price performance compared with bitcoin, it's no surprise that bitcoin dominance, the measure of BTC market capitalization compared with the market capitalization of all digital assets, **fell during 2021 from 70.2% to 40.1%**. ETH is not the sole reason for bitcoin shedding its dominance; rather, crypto projects have sprung up with many different use cases that are not competing directly with Bitcoin.

Ethereum has had major catalysts from **EIP 1559 to the impending transition to proof-of-stake**. Both events play important roles not only in the growth of Ethereum as a technology, but also in developing a narrative for Ethereum's native asset. EIP 1559 solidified ether's role as "gas" within the ecosystem, demanding that the asset be used and burned in exchange for building on or interacting with the network. The "Merge" to proof-of-stake is an attempt to create a secure, more scalable smart contract network **without the need for miners and significant energy consumption**.

Ethereum was the catalyst for the initial coin offering boom and bust in 2017/8 and out of the embers came the first wave of decentralized finance (DeFi). During 2019 and 2020, Ethereum-based projects such as Uniswap, Compound and Aave (formerly Lend) found their footing. Using the crypto bull market and liquidity mining (token incentives) as fuel, DeFi projects were able to acquire billions of dollars in liquidity for efficient decentralized lending and trading markets.

Ethereum can also credit a sizeable portion of its upswing to the **rise of non-fungible tokens (NFTs)**, which brought the protocol into the mainstream. NFTs are unique tokens that can act as digital representations of physical items or digitally native items whose proof of ownership can be verified on a public blockchain. As such, NFTs attempt to stand in as the first iteration of digital ownership of collectibles on a blockchain. OpenSea was the darling of the NFT sector in 2021, bringing a digital art marketplace to retail investors.

Executive Summary (cont.)

Inside the world of institutions and regulation, capital poured into blockchain and crypto companies. According to data from Blockdata, \$23 billion of funding reached these companies in 2021, which is more than the total amount raised from 2017 to 2020. We even saw a **\$1 billion capital raise** in December for NYDIG, and FTX raised more than \$1 billion across two funding rounds.

From a regulatory perspective, **governments across the world are taking crypto seriously**. We have seen China ban bitcoin mining and crypto trading outright. India and Nigeria have tried to do the same. The Bank of England said that the growth of crypto assets poses a potential threat in a Financial Stability Report as it becomes increasingly linked to wider financial networks. The word “crypto” even echoed in the halls of Congress as a **\$1 trillion infrastructure bill** was held up in part due to a crypto tax provision. Regulators’ involvement in and discussion of crypto is indicative of the widespread belief that **crypto is here to stay** and, because of that, should be regulated to “keep citizens safe.”

2021 was an **extraordinary year** for the cryptocurrency and blockchain industry. Bitcoin and Ethereum asset prices **touched all-time highs**; traditional businesses such as [Visa bought NFTs](#) like CryptoPunks and Bored Apes; [Stephen Curry bought a Bored Ape](#) and so did other professional athletes; politicians routinely discussed crypto policy; [China banned bitcoin mining and crypto trading](#); Coinbase [went public at a \\$100+ billion valuation](#) as a **profitable business**; more bitcoin made its way onto MicroStrategy’s balance sheet; [a sovereign nation made bitcoin legal tender](#) and the Lightning Network more than **tripled in size**; [legitimate layer-1 smart contract competitors](#) to Ethereum came to bear; over \$20 billion of venture capital and funding [flowed into companies](#); Bitcoin implemented a [protocol-wide improvement](#), [Ethereum did too](#) as it moved toward the Merge and proof-of-stake; a [Bitcoin ETF began trading in the United States](#) and debuted with the **second most volume ever**; DeFi took the virtual world by storm, with promises to remake the legacy financial system. This and much more in the pages that follow.

Thanks to 2021, most people have at least heard of crypto by now.

Performance

Performance – 2021 In Review

2021 was an exceptional year for crypto assets as both retail and institutional investors piled into assets – both new and old – fueling the total cryptocurrency market capitalization to grow 185%, from **\$773 billion to \$2.2 trillion**.

The following pages outline the data and narratives around the following:

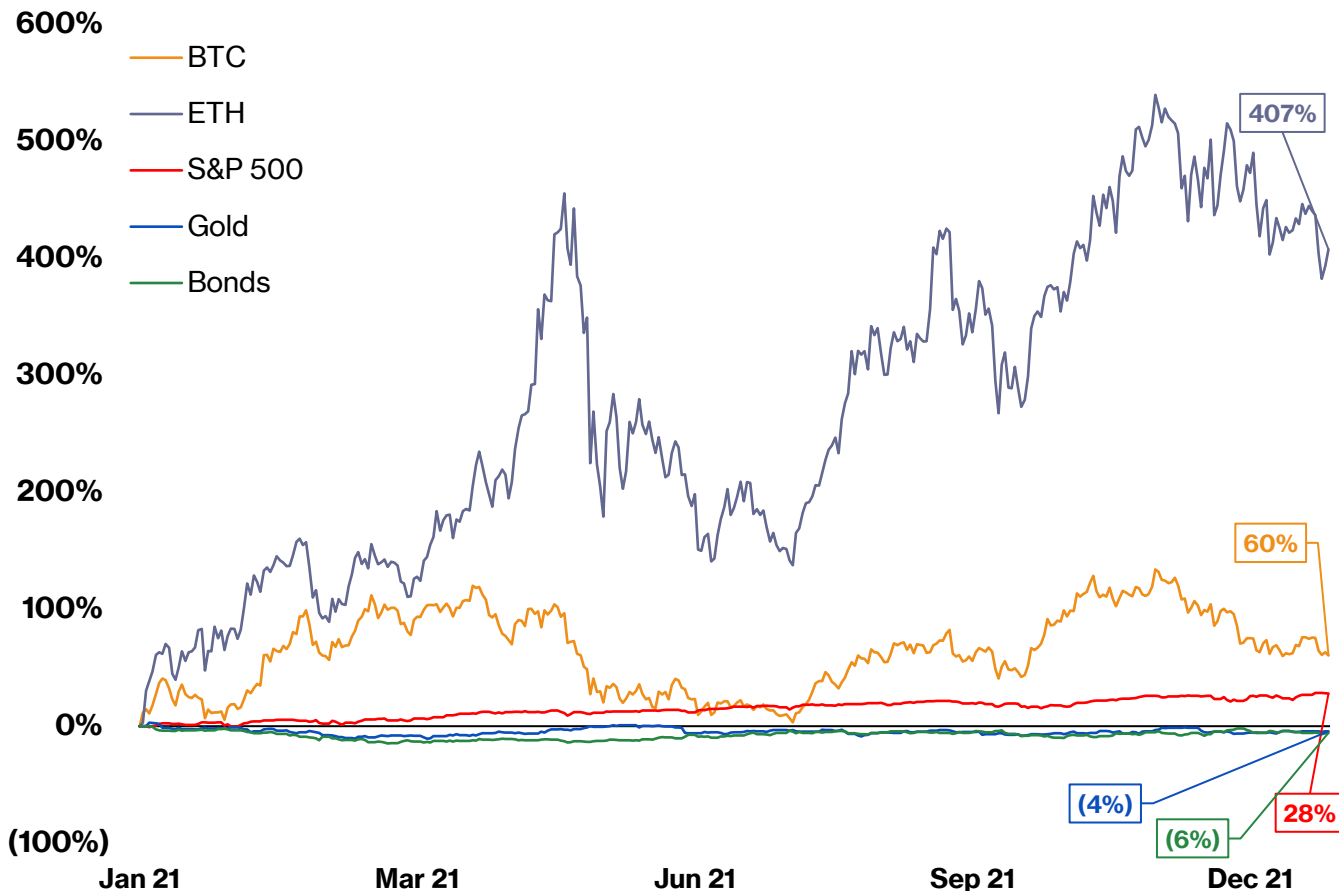
- BTC and ETH price outperformance relative to traditional macroeconomic assets.
- Volatility of digital assets compared to traditional assets.
- BTC's relationship and correlations with ETH and traditional assets, and what that means for BTC.
- Detailed annual return profile for CoinDesk 20 assets.

Crypto Assets Outperform Traditional Macroeconomic Assets

Macro Returns

BTC and ETH outperformed traditional benchmarks for stocks, bonds and gold in 2021, with the CoinDesk Bitcoin Price Index (XBX) and the CoinDesk Ether Price Index (ETX) gaining 60% and 407%, respectively.

While BTC shone in comparison to traditional risk-on assets like equities, ETH outperformed BTC, hinting that more money, institutional and retail alike, is entering the fold. Before 2021, bitcoin was the digital asset traditional investors paid attention to primarily as a store of value. Some of that attention has shifted to ether from investors who are skeptical of the bitcoin value proposition and view Ethereum as a better investment in disruptive technology.

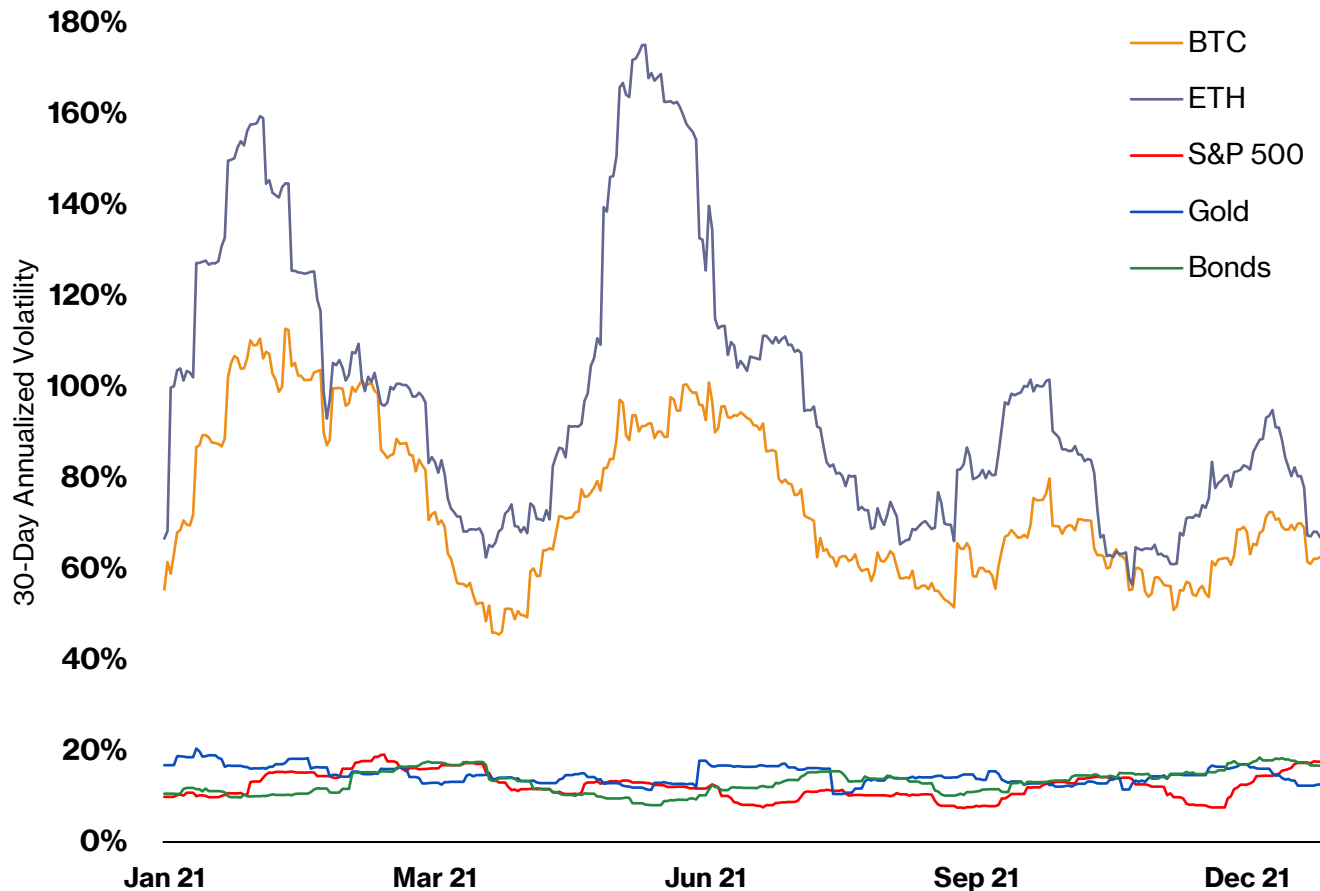


Source: CoinDesk Research, St. Louis Fed, Yahoo Finance. Bonds = iShares 20+ Year Treasury Bond ETF; Gold = London Bullion Market pm fixing price

Volatility

Even the 30-day annualized volatility metric for BTC and ETH looked volatile in 2021. Outsized returns can often be associated with outsized volatilities. As such, BTC and ETH volatility far outpaced the volatility of traditional assets.

Comparing crypto volatilities with that of traditional assets might be unfair, given the relative level of maturity between novel assets versus assets that existed prior to the advent of the internet. It does, however, provide important context that these are still nascent technologies with a lot of runway, potential and risk. The more time that passes where crypto continues to exist, the lower the expected volatility.



Source: CoinDesk Research, St. Louis Fed, Yahoo Finance. Bonds = iShares 20+ Year Treasury Bond ETF; Gold = London Bullion Market pm fixing price

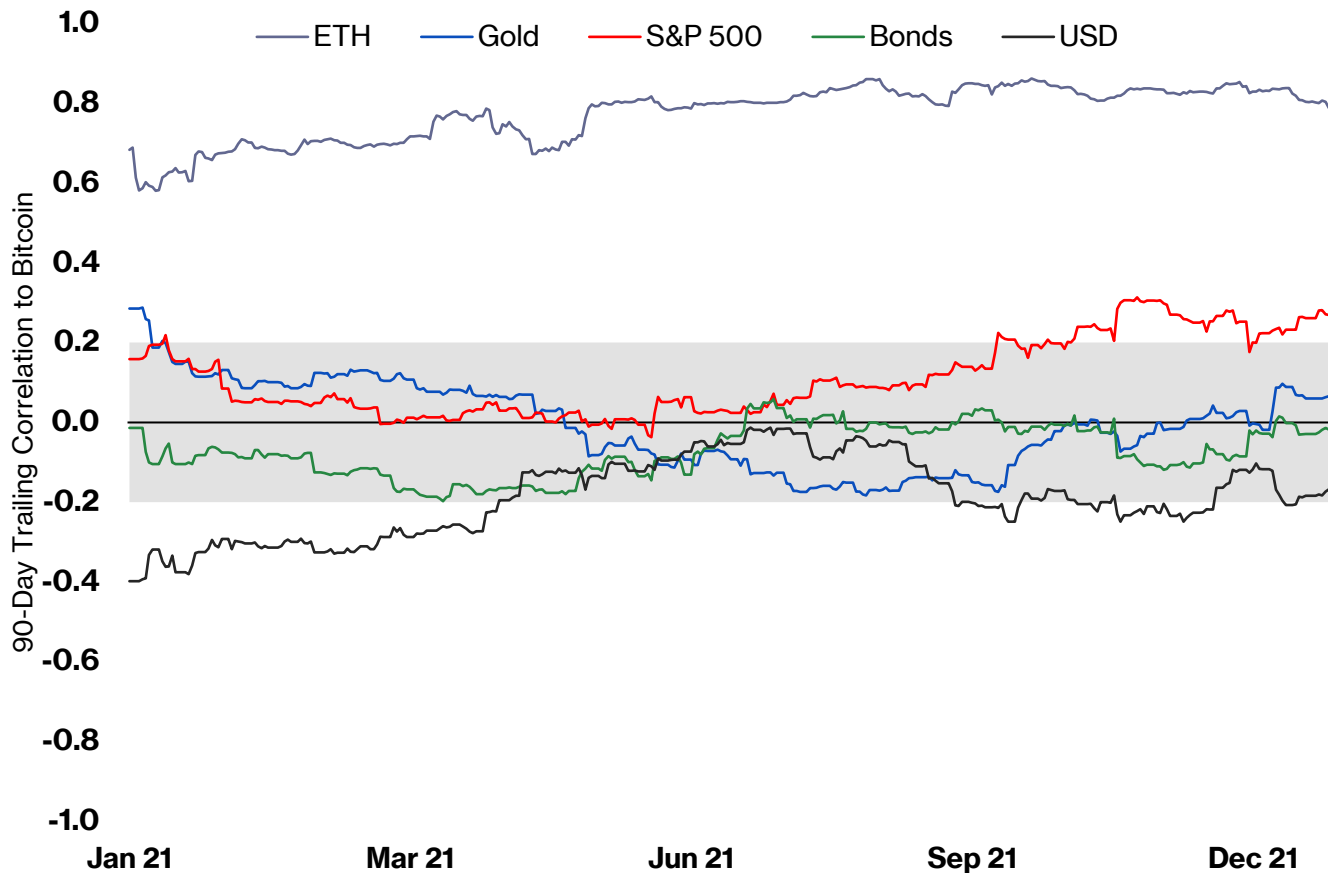
Correlations

In general, macro assets remained within an uncorrelated band (-0.2 to 0.2) in 2021. This is contrasted to 2H 2020, where gold and equities were somewhat positively correlated to BTC, and the U.S. dollar (USD) was somewhat negatively correlated to BTC. Bitcoin is a unique macro asset like no other.

It is also interesting to note that S&P 500 correlation trended down and then back up in 2021. That could suggest that investors are bucketing BTC as a risk-on asset and are trading it accordingly.

Meanwhile, ETH remained tightly correlated to BTC even as ETH outperformed, suggesting that BTC's price remains an important indicator for all digital asset investors.

90-Day Trailing Correlations to Bitcoin



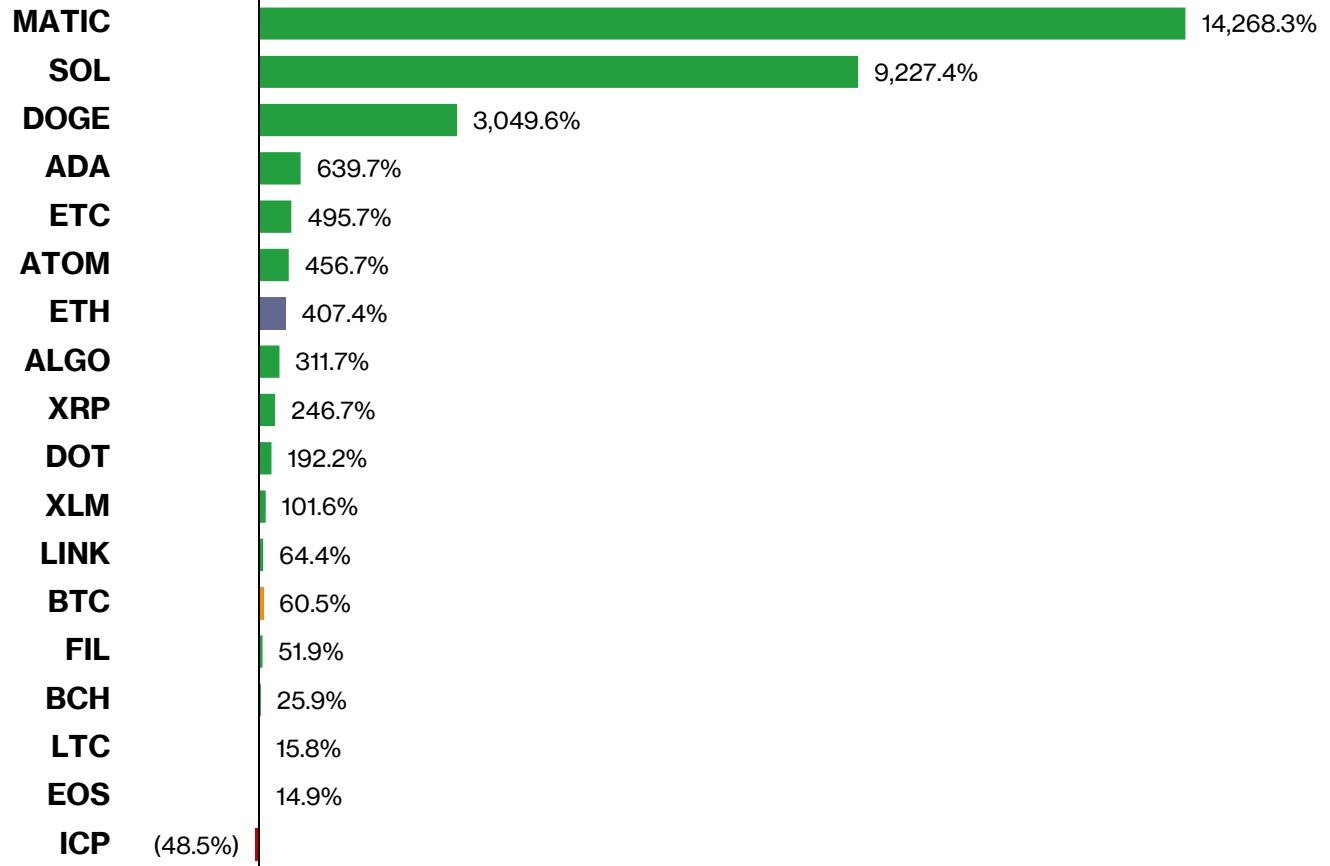
Source: CoinDesk Research, St. Louis Fed, Yahoo Finance. Bonds = iShares 20+ Year Treasury Bond ETF; Gold = London Bullion Market pm fixing price

CoinDesk 20

2021 was an exceptional year for crypto asset price performance. Virtually all digital assets gained in 2021, following a wave of interest and adoption across all crypto subindustries and use cases.

The biggest outperformers came in the form of alternative smart contract platforms or “layer 1s” (SOL, LUNA, AVAX), “layer 2” scaling solutions for ETH (MATIC) and meme coins that became a part of the fabric of internet culture (DOGE, SHIB).

Crypto Assets Outperformed in 2021



Source: CoinDesk Research

Bitcoin

Bitcoin – 2021 in Review

We started 2021 with Q4 2020's narrative around institutional adoption still on the tip of everyone's tongue. Tesla, Square and others joined MicroStrategy in adding bitcoin as a reserve asset to their balance sheets. Of note, **most announcements of “bitcoin on the balance sheet”** were one-time events, except for MicroStrategy, which raised multiple rounds of convertible debt capital and junk bonds to fund bitcoin purchases, ending 2021 with 124,391 BTC on its balance sheet, a whopping 0.658% of the total circulating supply. The first quarter also saw the successful launch of three bitcoin ETFs on the Toronto Stock Exchange.

The momentum from Q1 carried into Q2 as much discussion centered on the **environmental impact of Bitcoin mining** ([read our report](#)), prompting spirited debate on Twitter and countless op-eds and misleading statements from politicians and thought leaders. From these debates came a plethora of “clean” bitcoin mining initiatives. On top of that, bitcoin hit an all-time high in April – **driven primarily by leverage** – only to come crashing back down, ending the quarter with a -40% return. Bitcoin's hashrate then became the center of public scrutiny and debate after Tesla announced it would suspend bitcoin payments over environmental concerns, leading to the formation of a new industry cooperative called the Bitcoin Mining Council (BMC). Arguably the biggest crypto news from Q2 was the announcement – facilitated by Jack Mallers of Strike at Bitcoin 2021 in Miami – **that El Salvador was going to adopt [bitcoin as legal tender](#)**. China meanwhile went the other way and banned crypto trading, sparking a short-term negative market reaction.

Right at the end of Q2, **China also cracked down on bitcoin mining in a big way by banning it outright**. Hashrate had hit an all-time high of about 178 exahashes per second in mid-May and then precipitously dipped to a low of about 89 EH/s by early July in Q3. Since then, we have seen hashrate continue its upward climb back toward all-time-high territory (hashrate ended 2021 at 179 EH/s). The conversation around the mining industry was that there was an east-to-west migration of mining operations, and right on cue the CBECI published data that suggested that as of April 2021, **100% of hashrate had migrated out of China and flowed into the U.S., Russia and Kazakhstan**, among other countries. During Q3, El Salvador making bitcoin legal tender showed up in empirical data points, as the amount of bitcoin committed to **the Lightning Network grew aggressively**, finishing the quarter up about 11% and the year up about 215%.

Bitcoin – 2021 in Review (cont.)

As bitcoin continues to grow into its “store-of-value” and “digital savings technology” use cases, it is harkening back to its roots as a “purely peer-to-peer version of electronic cash,” given the growing incidence of real-life implementations of the Lightning Network.

If Q3 was characterized by the immense growth of the digital cash use case for bitcoin, the start of Q4 poured more gas on “the store-of-value use case” flame as the **U.S. Securities and Exchange Commission approved the first ever futures bitcoin exchange-traded fund in the United States**. There was a lot of hype around the launch, and the ETF (Ticker: BITO) hit a trading volume of about \$1 billion by the end of its first day, making it the **second-most heavily traded new ETF on record**. However, much consternation was expressed around the fact that the ETF was a futures-based ETF rather than a spot ETF. Instead of holding physical bitcoins for investors, **BITO uses an amalgamation of futures contracts** to mimic the price action of spot bitcoin. To the individual investor, this was viewed as onerous and further strengthened the narrative around the need for a spot bitcoin ETF. In fact, if we look outside the U.S. we see that [spot ETFs are favored globally](#), and believing that such interest exists in the U.S. doesn’t take a leap in logic.

Nonetheless, the launch of the U.S. futures bitcoin ETF fed the hype as bitcoin eclipsed another all-time high of **\$68,990.90 on Nov. 10**. The price then plunged to the \$58,000 range through the end of November to mid-December. Despite expectations from many exuberant bitcoiners of ending 2021 with a \$100,000 price tag on a single bitcoin, the price sputtered out and ended the year at **\$46,712.90, up 60%**.

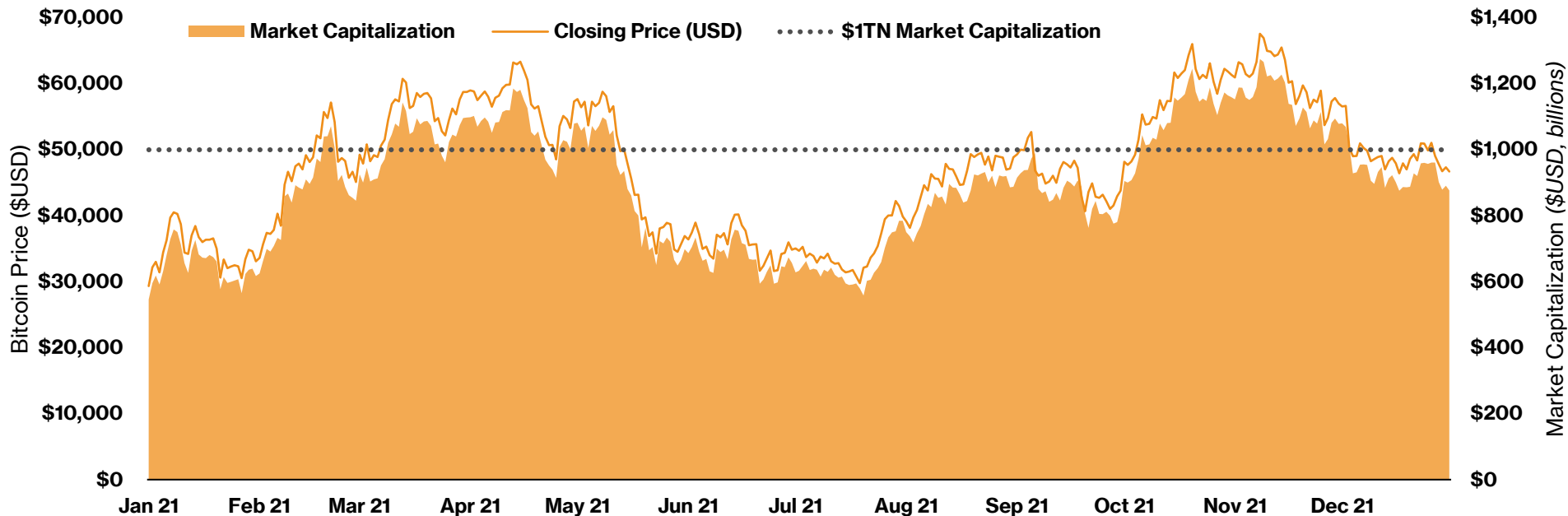
As much as 2021 was a monumental and formative year for Bitcoin, 2022 could prove to be an even more important year in the long term. **There is an air of legitimacy now:** Bitcoin is no longer viewed as an esoteric digital currency used only on the fringes by techies and cypherpunks. We are seeing legitimate corporations, institutions, national governments and individuals who have staked their reputations and, more importantly, their capital on the success of this ecosystem. The chance that bitcoin fades into obscurity is approaching something that closely resembles zero.

Tick tock, another block.

BTC Market Performance

Although bitcoin was eclipsed by many other cryptocurrencies, its price performed well in 2021, gaining 61%. Bitcoin opened the year at \$29,111.52 and breached all-time highs twice - in April at \$64,888.99 and in November at \$68,990.90. Bitcoin seemed primed to enter 2022 as a trillion-dollar asset after reclaiming the title in early October, only to lose it on the back of a poor price performance in December where BTC price shed 18%. That said, bitcoin closed above \$1T market cap 121 of 366 days – a monumental achievement for an asset that was worthless 12 years ago. Looking forward, the more time bitcoin spends above \$1T market cap, the more it will be on the minds of investors.

Bitcoin Price Fared Well in 2021



Quarterly & Annual Performance

Since 2015, Q4 has been the strongest quarter for BTC price performance, averaging gains of 67%; granted that average is skewed given the price movements in 2017 and 2020. However, in Q4 2021, bitcoin rose only 6.7%. When compared with other positive performing Q4s, 2021 is a poor performer. Nevertheless, that is not cause for alarm. There is something to be said for how large bitcoin has become in 2021. It is insufficient to compare a 6.7% gain in 2021 on a \$800B - \$1T asset with a 57.6% gain in 2016 on a \$5B - \$10B asset and thus conclude one is better than the other. BTC's size in 2021 means it is on the precipice of gaining an important role in global economics and commerce – something that couldn't be said in 2016.

Surprisingly Muted 4th Quarter Price Gain in 2021

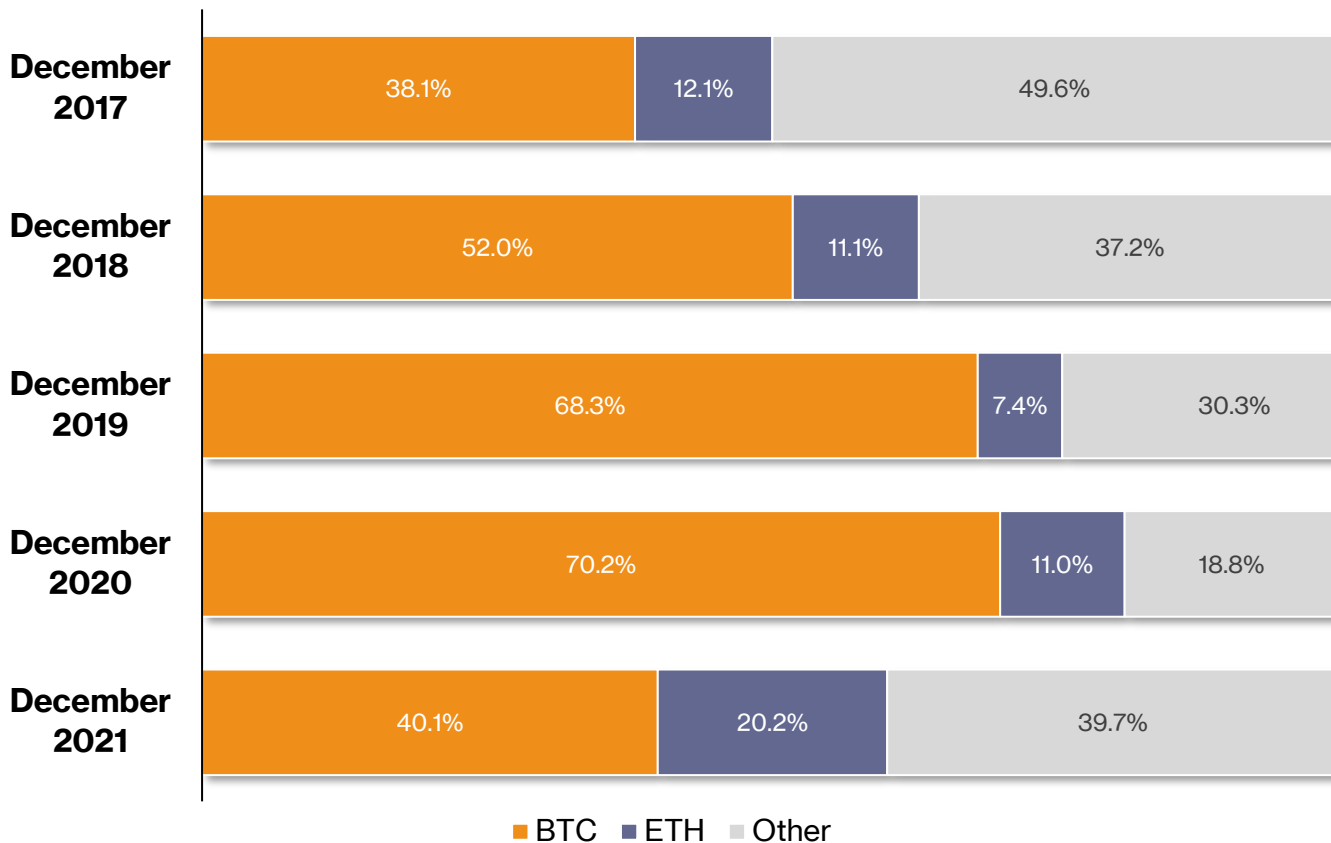
Quarterly Returns

	2015	2016	2017	2018	2019	2020	2021
Q1	(22.0%)	(2.5%)	10.1%	(46.6%)	11.0%	(10.2%)	101.7%
Q2	4.5%	53.2%	142.9%	(9.0%)	167.0%	41.9%	(40.6%)
Q3	(7.9%)	(4.8%)	65.2%	4.8%	(24.6%)	17.4%	25.7%
Q4	78.5%	57.6%	210.4%	(44.5%)	(12.9%)	171.0%	6.7%
Annual	34.0%	124.1%	1,271.4%	(71.8%)	94.6%	305.5%	60.5%

BTC Market Capitalization Dominance

Since 2017, bitcoin dominance, the measure of BTC market capitalization compared with the market capitalization of all digital assets, has marched upward. That changed in 2021, with BTC dominance ending 2021 at 40.1% after closing 2020 at 70.2%.

As with quarterly price performance, we need some context. Bitcoin is not “losing” to other digital assets. Bitcoin is cementing itself as a sound money and global monetary network, and the projects that are gaining market cap against BTC aren’t competing for that spot. Waning dominance more accurately suggests that there is money flowing into other projects with different use cases.



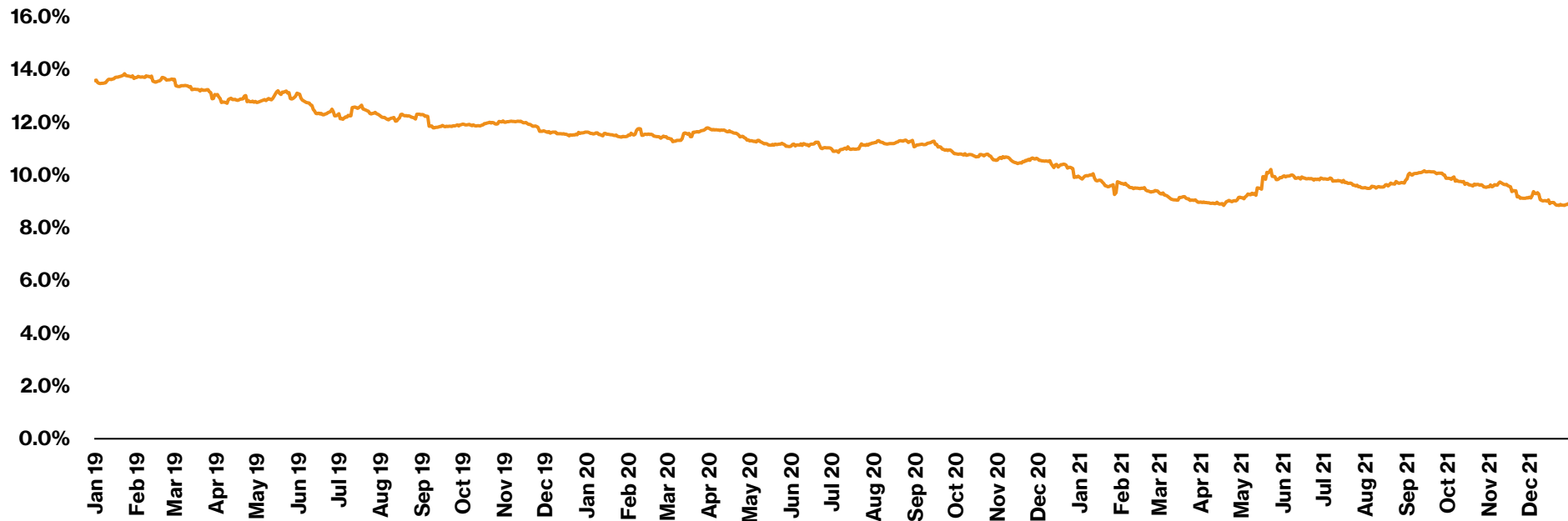
Source: CoinMarketCap

2021 Annual Review

Liquidity & 'HODL' Behavior

BTC liquidity is defined by the ratio of liquid supply (outflows/inflows > 0.25) to illiquid supply (outflows/inflows < 0.25). This measure has consistently declined since 2019, suggesting that more and more bitcoin is being held as a long-term investment. This can exacerbate price movements in both directions, as demand for the asset changes. Despite a declining on-chain liquidity measure, the glut of growth among exchanges and brokerages means it remains trivial to exchange bitcoin between currencies and other digital assets. The illiquidity of bitcoin on-chain doesn't imply trading illiquidity.

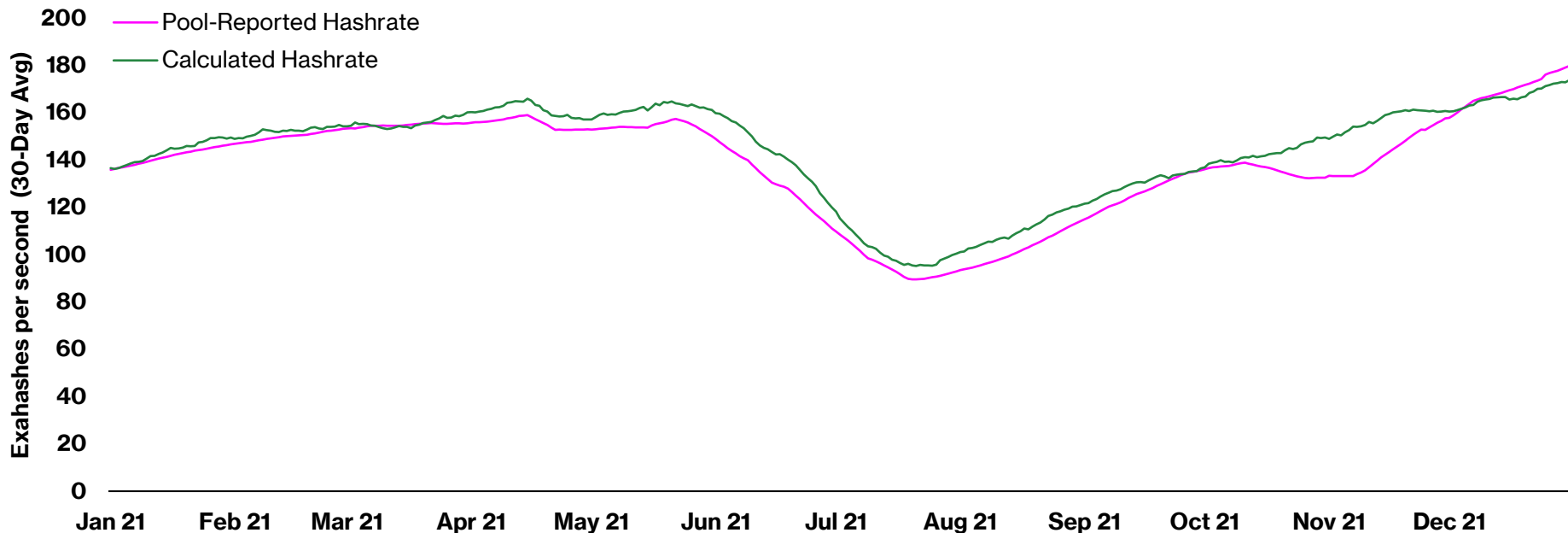
Bitcoin's Liquidity Is Falling as Investors Continue to 'HODL'



BTC Hashrate

Following China's crackdown on bitcoin mining in Q2, hashrate, the amount of computational power being used to process transactions, dipped precipitously. Since then, Bitcoin's hashrate has recovered, with pool-reported hashrate eclipsing the 30-day average May high of 158 EH/s in December and hitting a point-in-time, all-time high of 189 EH/s on the last day of the year, suggesting that the miners have either relocated or turned their rigs back on after a lack of enforcement in China. However, data on the following page suggests that bitcoin miners successfully relocated their security infrastructure, all while experiencing no downtime.

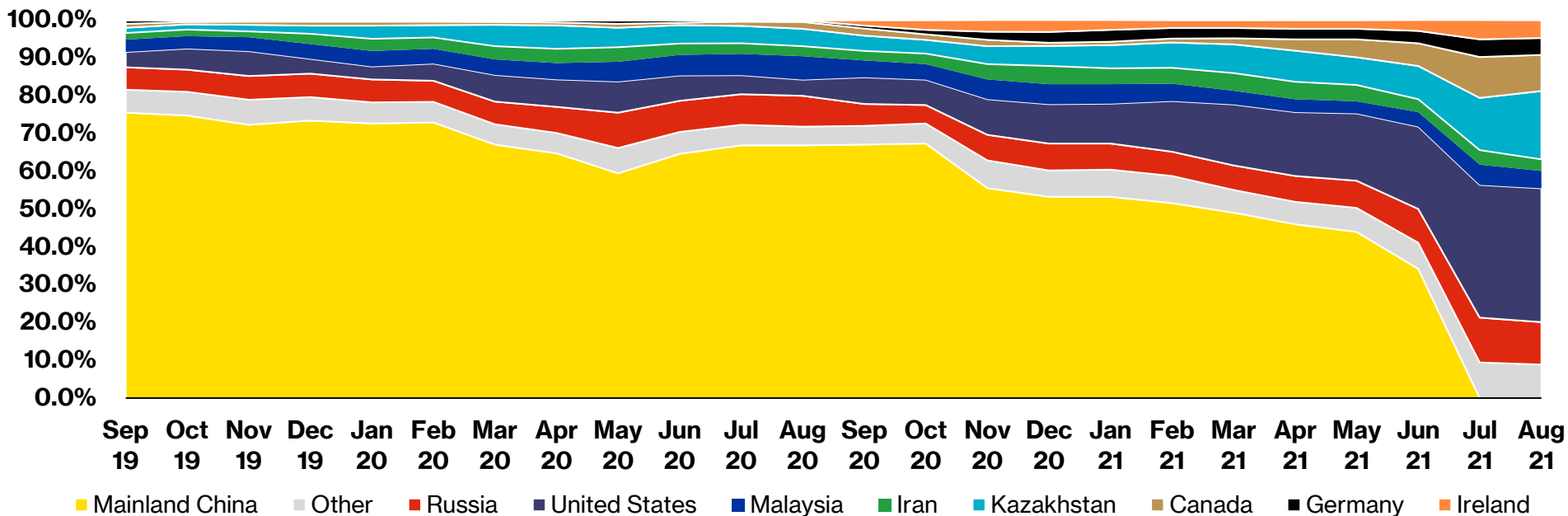
BTC Showcased Resilience Through Hashrate Recovery



BTC Hashrate (cont.)

When hashrate fell in Q2, it was widely believed it was due to regulation that set off an “east-to-west” migration from China to the rest of the world. However, that belief was largely rooted in anecdotes and statements from industry experts, rather than in empirical data. In October, the Cambridge Centre for Alternative Finance published data that showed China’s share of global hashrate fell to almost zero by July. Cambridge’s data supported the notion that China is no longer the dominant geographic player in hashrate, while the United States, Russia and Kazakhstan experienced growth in hashrate in 2021.

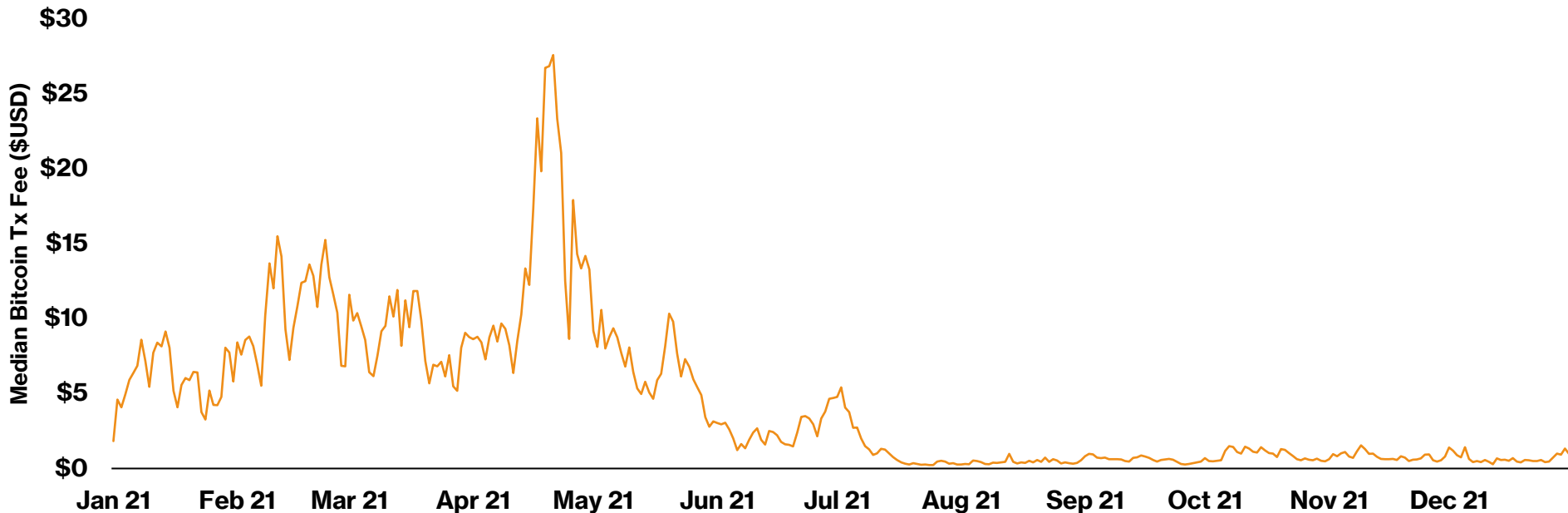
Geographic Diversity of Hashrate Has Greatly Improved Since 2019



Transaction Fees

A common critique of Bitcoin is that its transaction fees are too high and unpredictable for use in casual commerce. That has historically held true, with transaction fees spiking in Q1 and Q2. Higher fees have led to the rise of layer 2 scaling solutions, such as Lightning. However, transaction fees in Q3 reached yearly lows, with 1 sat/vB transactions common, the lowest fee rate possible, clocking in at around \$0.06. However, low fees could be a source of some concern for the Bitcoin blockchain because transaction fee rates respond to changes in demand for block space on the blockchain and so low fees may be indicative of falling demand for using bitcoin.

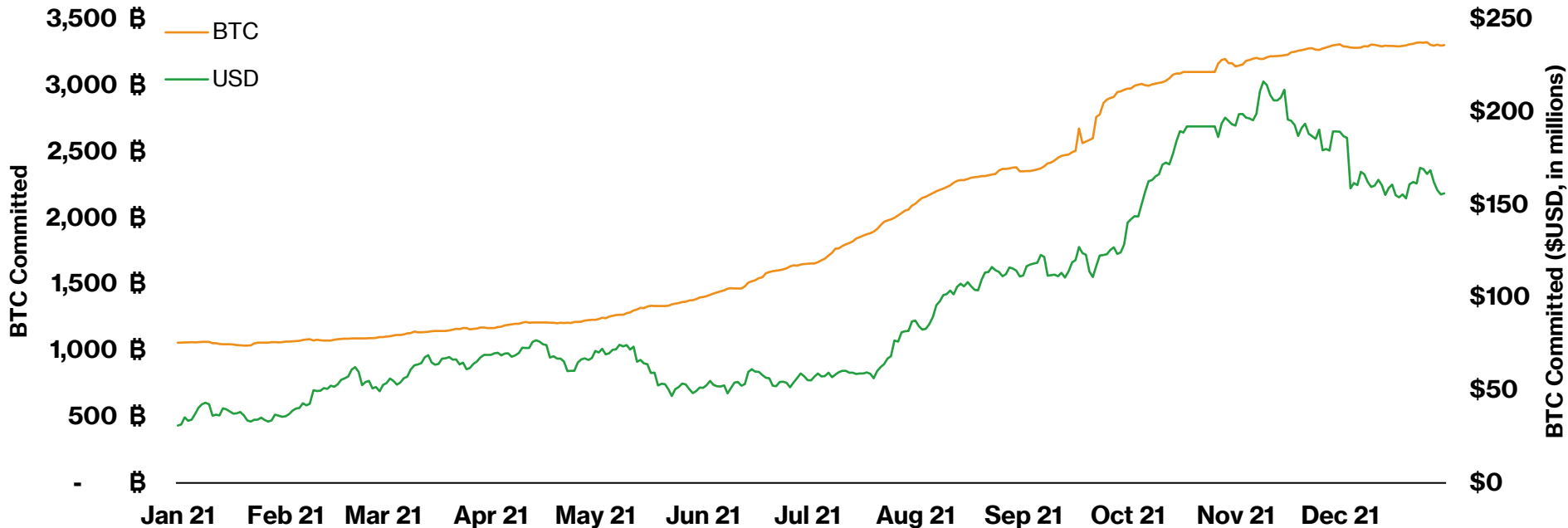
Bitcoin Fees Bottomed Out in 2021, but Have Been Ticking Up in Q4



Lightning Network Capacity

In our Q3 report, we highlighted that since El Salvador made bitcoin legal tender in June, the amount of bitcoin committed to the Lightning Network, a Bitcoin overlay network that enables cheap and instantaneous bitcoin payments, has grown about 97% to about 2,900 BTC. Since then, Lightning Network capacity has grown to over 3,300 BTC. As Bitcoin continues to grow into its “store-of-value” and “digital savings technology” use cases, it is harkening back to its roots as a “purely peer-to-peer version of electronic cash,” given the growing incidence of real-life implementations of the Lightning Network.

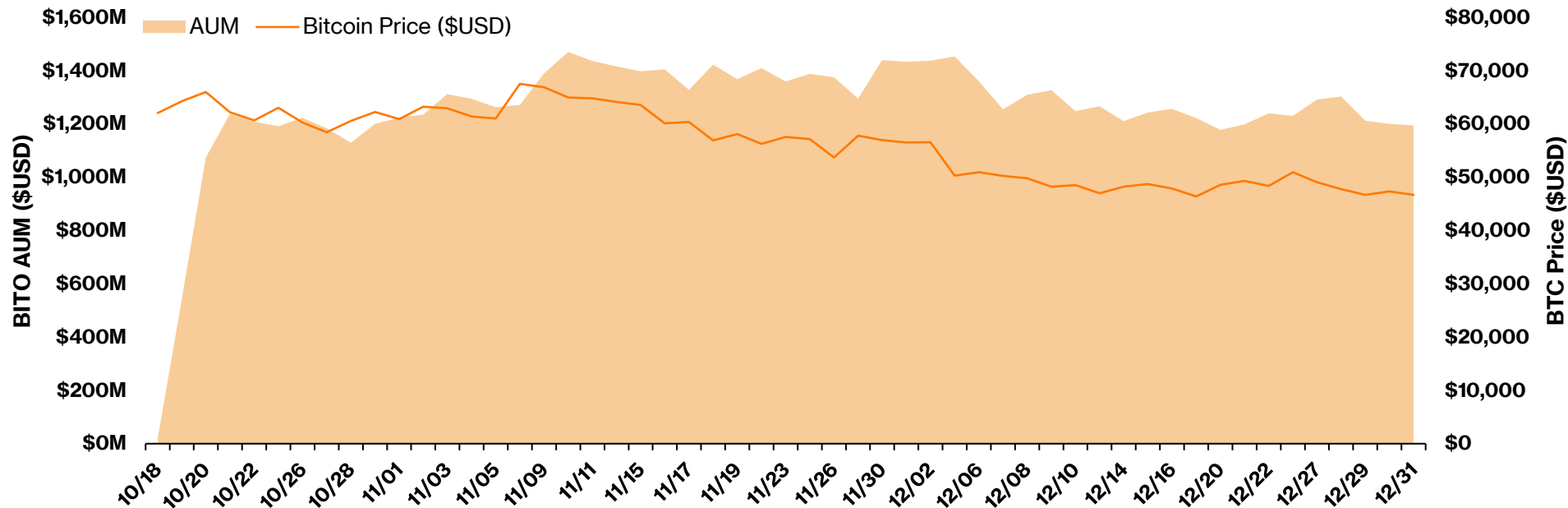
Bitcoin Committed to the Lightning Network Exceeded 3,300 BTC



Bitcoin Futures ETF

In October, the Securities and Exchange Commission (SEC) approved the the first bitcoin futures exchange-traded fund (ETF) in the United States. Although not the first Bitcoin ETF, the ProShares Bitcoin Strategy ETF (BITO) was the first to list on the New York Stock Exchange. On its first day of trading, BITO did over \$1 billion in volume, the second highest of any ETF at launch. However, there was much consternation among investors, given the ETF was based on futures rather than a physically held bitcoin. To bitcoin proponents, it felt onerous to have a futures ETF when an individual could easily access bitcoin through an exchange and pay much lower fees. Many bitcoin spot ETFs remain unapproved by the SEC.

Bitcoin Futures ETF Debuted, but Investors Want More From SEC



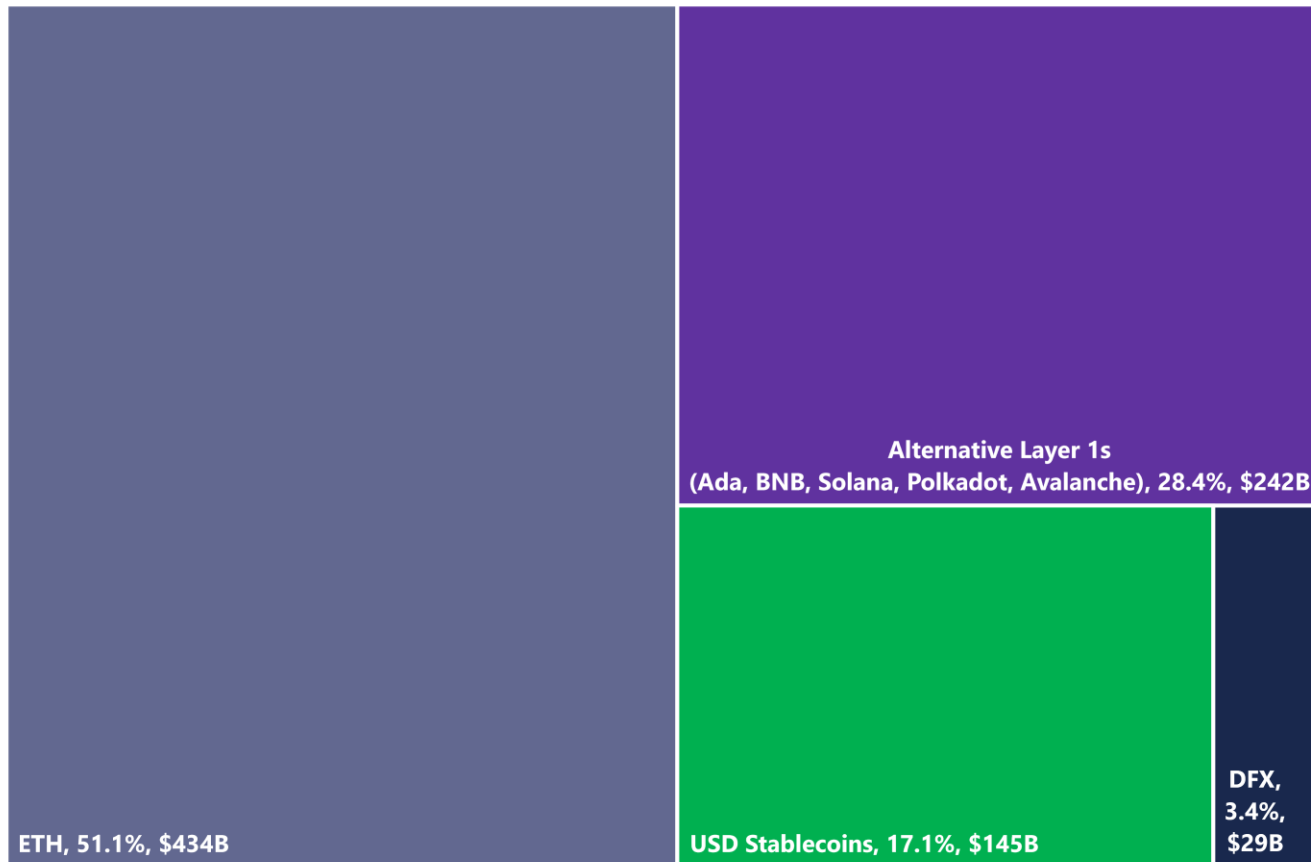
Ethereum

ETH Dominance

A recurring theme throughout 2021 was the overperformance of alternative layer 1 smart contract chains. The native tokens of Avalanche (AVAX), Terra (LUNA), Solana (SOL) and Binance Smart Chain (BSC) all significantly outperformed ETH throughout the year.

While DeFi showed signs of life near the end of December, the subsector of crypto continued to underperform layer 1s. The cyclical nature of crypto has left DeFi tokens behind as traders and investors look for tokens with further upside potential.

While no single asset looks primed to flip ETH in market capitalization, the collective group of alternative layer 1s make up a significant portion of the crypto market.



Source: CoinDesk Research, CoinMarketCap

2021 Annual Review

Beacon Chain

Ethereum's proof-of-work (POW) chain appears to finally be winding down after years of development and delays. During October, the Ethereum Foundation, ConsenSys, and POW and proof-of-stake (POS) client teams met for an interoperability event in Greece, **creating the Amorpha test network** and taking a large step toward **merging Ethereum's mainnet with the proof-of-stake Beacon Chain**.

The Amorpha test network is a multiclient devnet and the result of tying execution (POW) and consensus (POS) clients into a single interoperable chain. The first of its kind, Amorpha set the stage for building larger, interoperable test networks like Kintsugi, which was released in December. Amorpha and Kintsugi give Ethereum and application developers a chance to build on the proof-of-stake network and find any potential bugs that can be mitigated before the mainnet Merge.

The state of the current Beacon Chain, the framework of the proof-of-stake network, is improving daily, with consistent liveliness and a growing node count. There are more than **8.87 million ETH** locked in the staking contract for a **value of over \$33.79 billion**. The 8.87 million ETH is also representative of **276,631 validators** securing the proof-of-stake network.

Last quarter, we raised the issue of client diversity as Prysm made up nearly 60% of all validator clients. Three months later, the issue remains relevant as larger institutions have heavily favored Prysm as a single client. However, staking provider [Lido has mapped out how it plans to strengthen client diversity](#) and decentralization.

Finally, the Altair upgrade took place in late October, providing light-client support to the Beacon Chain and slightly altering validator mechanisms and incentives. More importantly, the upgrade was one of the first forks that took place on the Beacon Chain, and validators effectively updated their nodes in time to keep the network up and running.

Ethereum – 2021 in Review (cont.)

EIP 1559/Tokenomics

Ethereum's revised fee market and token economics had a widespread impact on the network, much larger than most experts had estimated. While mania in NFT and decentralized finance (DeFi) markets were largely responsible for that, **network activity burnt 1.3 million ETH since Aug. 4.**

Ethereum's inflation rate decreased by around 66% since EIP 1559's implementation. Post-Merge, mining rewards will disappear and be replaced with attestation, proposal and sync committee incentives, the sum of which will be much smaller than the current 2 ETH per block reward. An [Ethresear.ch study](#) estimated that in the mid- to long-term, **ether's supply will drop to anywhere between 27.3 and 49.5 million**, 60-76% less than current supply.

Outside of tokenomics, EIP 1559 had a positive effect on gas fee variability and was responsible for saving block space consumers around 9% in effective gas fees over the past four months. Exchanges constantly processing withdrawals and moving users funds saw the largest boost in savings, with EIP 1559-style transactions saving [Coinbase an average of 27 ETH](#) on gas fees daily. EIP 1559's success led to adoption outside of Ethereum's mainnet with Polygon and Avalanche C-chain implementing their own form of the fee market.

The upgrade had some market participants worried about the negative impact a fee burn would have on Ethereum's mining ecosystem. However, miners are seeing cash flows comparable with cash flows before the upgrade because of the associated price increase in ether. As the network switches to proof-of-stake, the need to pay network validators such copious amounts of ether dies – running a validator is much cheaper and more energy efficient than running a mining rig.

ETH Market Performance

ETH ended 2021 up 408% on the year, leaving the asset at a \$444 billion market capitalization. ETH saw its lowest level in years during the March 2020 crash, bottoming at \$90.10 on Coinbase and returning a multiple of 54.1x at the November peak. If November marked the end of the cycle, ETH underperformed relative to the previous crypto bull market. From December 2016 to 2018, ETH returned a multiple of 241x. In order to match last cycle's appreciation, ETH would need to hit \$21,700.

ETH Finishes 2021 Up 408%



ETH / BTC Chart

ETH continued its uptrend against BTC in Q4, hitting as high as 0.088 ETH / BTC, the highest relative level since February 2018. Year over year, ETH is up 196% in terms of BTC and continues to gain [institutional interest](#). However, the significant breakout against BTC that took place in the 2017 bull market has yet to happen. Price action near the end of December put a damper on market participants calling for “the Flipping” and knocked the ETH / BTC ratio off its latest highs.

The ETH / BTC Ratio Ends 2021 on Recent Highs



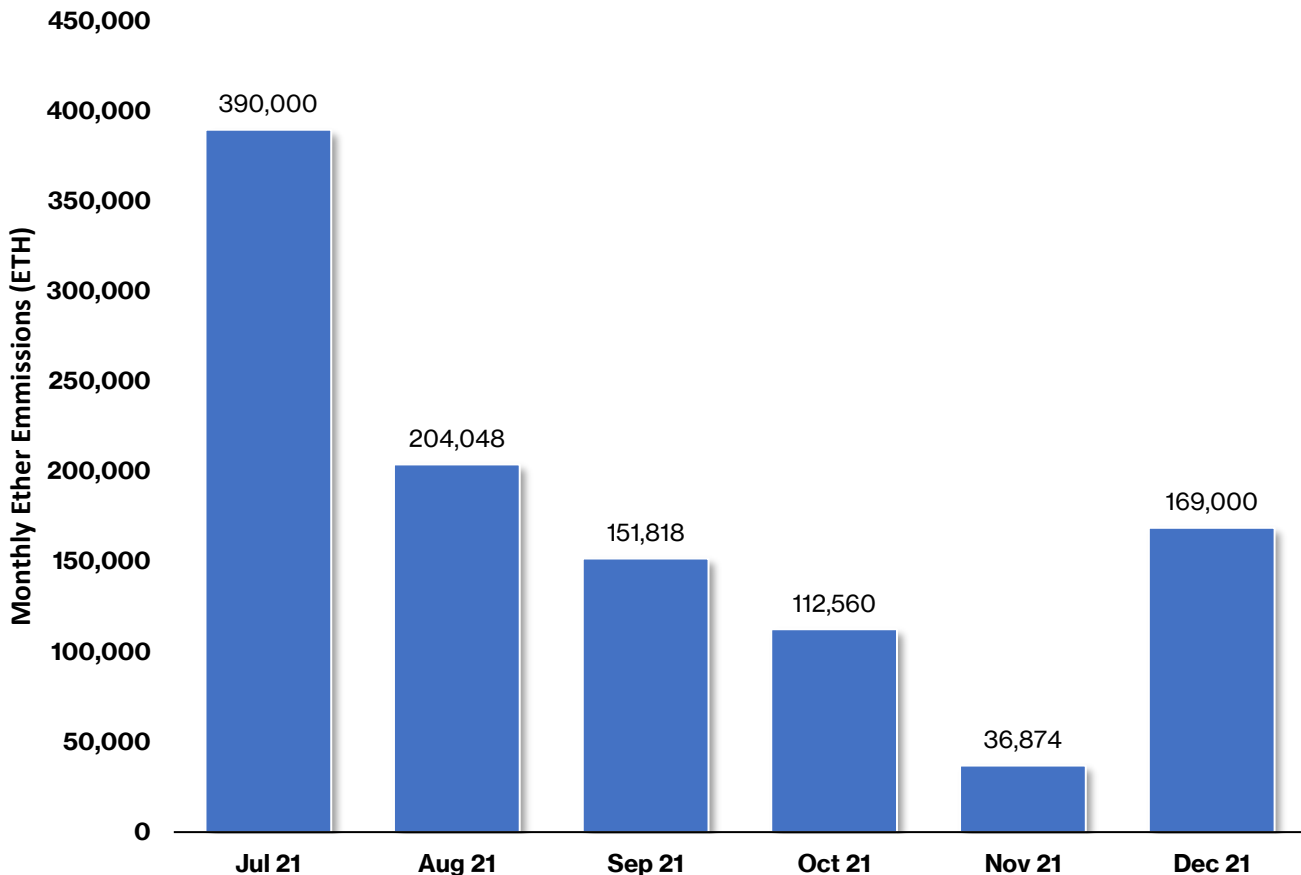
Glimpses of Deflationary Ether Appear After EIP 1559

Ether Emissions

Transaction fee burns outweighed block reward inflation regularly after EIP 1559. If network activity increases much further, ether will be consistently deflationary even before the Merge. The usage of OpenSea and Uniswap alone has burnt 300,000 ETH, nearly \$1.15 billion at year-end prices.

Network experts believe this is just the beginning for deflationary ether as block rewards will fall significantly with the Merge and transition to proof-of-stake.

Read more: [EthResear.ch - Circulating Supply Equilibrium](#)



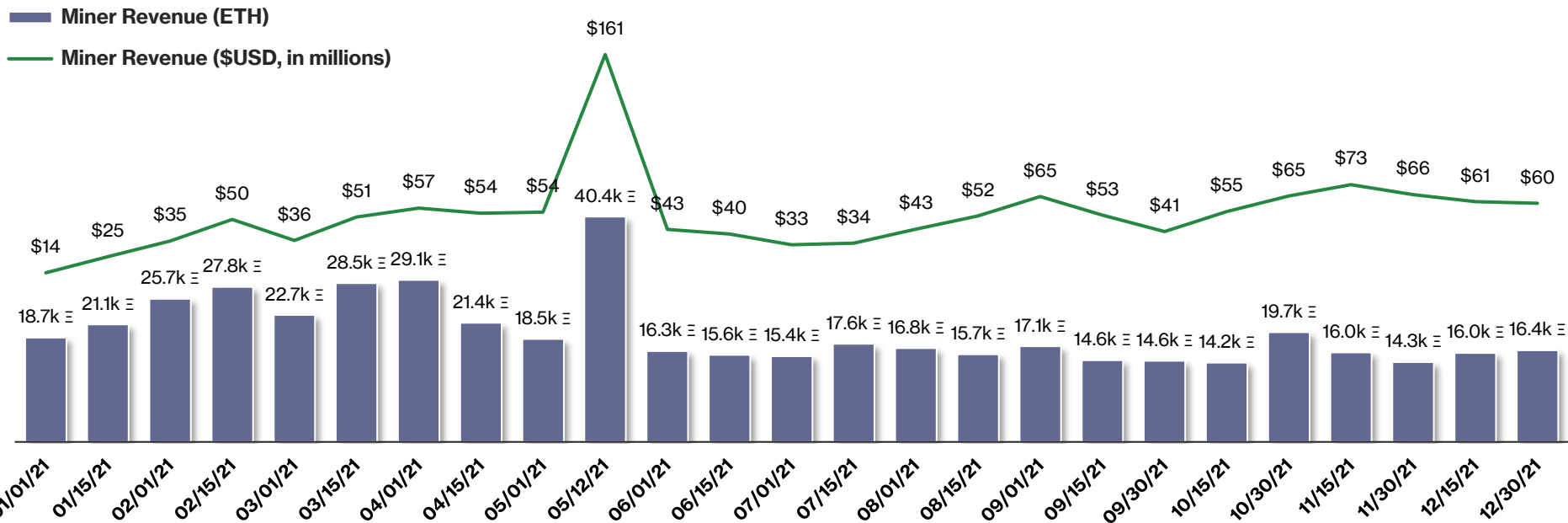
Source: [Watch The Burn](#)

2021 Annual Review

Miner Revenue

As we noted in Q3, EIP 1559's effect on miner revenue has been a community concern leading up to the Merge. Since it was introduced with the London hard fork on Aug. 4, miner revenue has steadily increased alongside the price of ether. While the upgrade wasn't directly responsible for the increase in market value of ether, slowing emissions helped take significant sell pressure off Ethereum's native asset.

Miner Revenue Significantly Above Pre-EIP 1559 Levels



Ethereum – 2021 in Review (cont.)

DeFi

Decentralized finance (DeFi) as a sub-industry of crypto showed astonishing growth year over year (YoY) in total value locked (TVL), trading volume, revenue and many other metrics. **Curve, Maker and Convex all surpassed \$20 billion in TVL** during 2021 and show no signs of slowing down soon.

While it's true that a large portion of TVL growth can be attributed to a rise in crypto asset prices, the growth of stablecoins and a general increase in usage of the platforms were also responsible. Not only did **USDT and USDC add \$95.75 billion in supply** over the year, leveraged stablecoins like DAI and MIM came into play, bringing further capital efficiency and increased risk with DeFi. The market has started to **de-risk from centralized stablecoin providers**, with crypto-native algorithmic stablecoin **UST joining DAI in the top 5 stablecoins**.

The growth in TVL and DeFi revenue is undeniable, but the fat protocol thesis continues to ring true as value accrual skips governance tokens and rises up to the blockchain layer. **DeFi / ETH has consistently fallen throughout the year** and some big-name governance tokens are even down against the USD YoY. The same findings remain true chain to chain, with AVAX, SOL and LUNA all outperforming their underlying DeFi ecosystems.

Compound Finance issued a quarterly report to help drive transparency throughout DeFi and brought forward many interesting questions. Should liquidity mining rewards be baked into earnings as a loss? Are there any profitability metrics useful to apply to DeFi as a whole? The next sustained bear market will be quite telling and only protocols with truly innovative products will be able to survive.

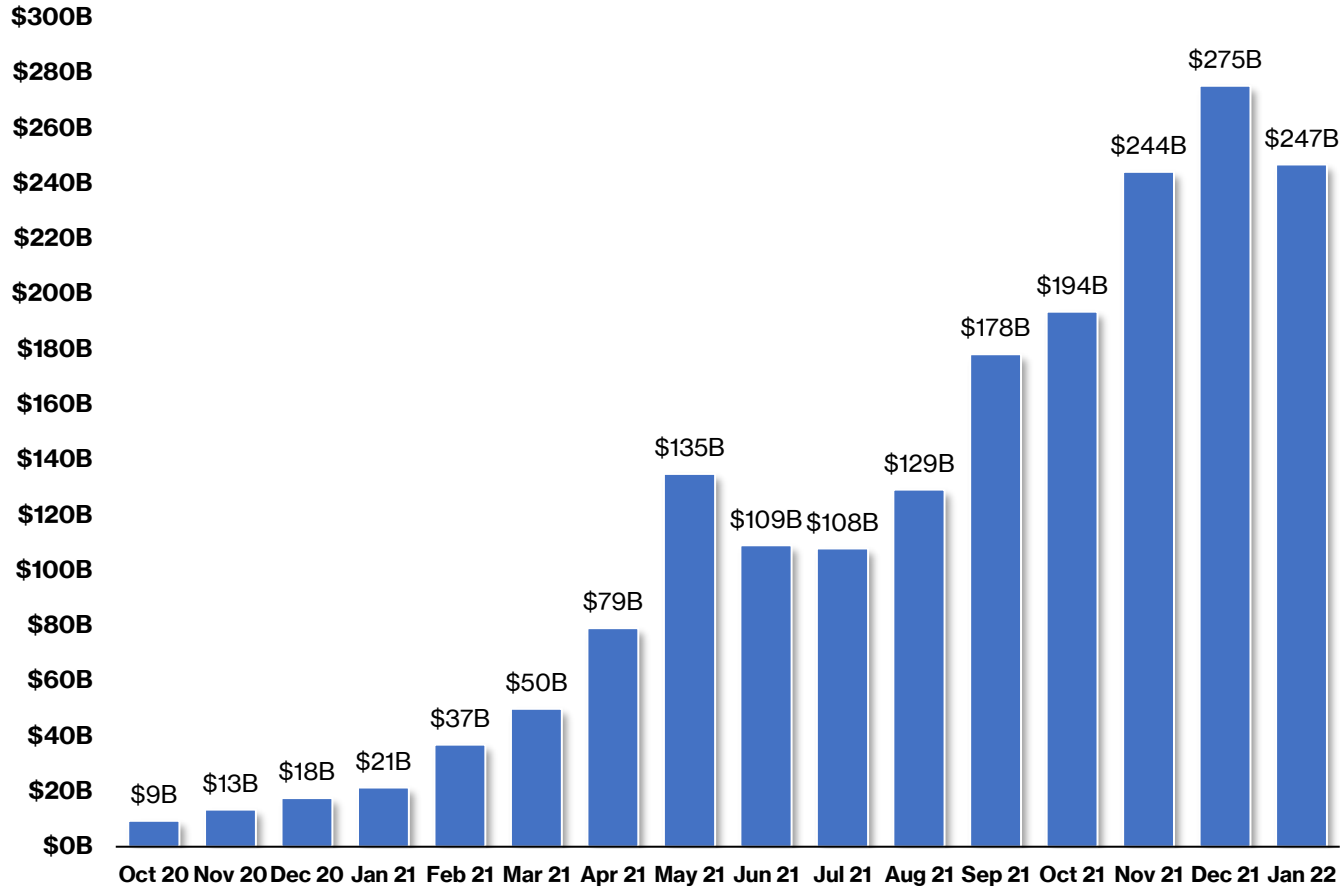
Price Appreciation and Stablecoin Inflows Grow DeFi TVL

Total Value Locked in DeFi

The DeFi ecosystem ended 2021 sitting right below its all-time high in TVL. The year started with \$18.71 billion supplied to exchanges, lending platforms and yield optimizers and multiplied by 13x throughout the year.

A significant portion of this growth is thanks to price appreciation in the crypto assets used throughout DeFi, although new market participants minted \$111 billion in stablecoins during 2021.

The future is bright as blue-chip applications look to integrate real-world assets in the DeFi ecosystem, bringing efficiency to leverage, liquidity and under-collateralized loans.



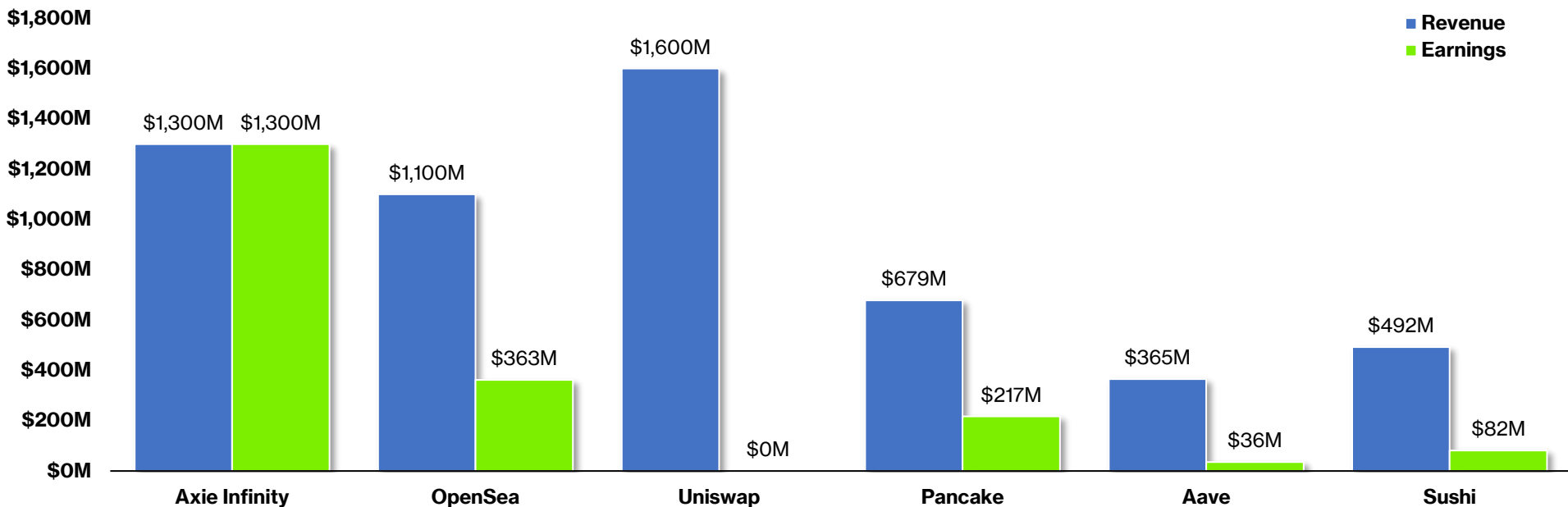
Source: CoinMarketCap

2021 Annual Review

DeFi Revenue & Earnings

Decentralized applications continued to generate outsized revenue for liquidity providers and earnings for token holders as DeFi, gaming and NFTs all saw further adoption. The addition of fundamentals throughout crypto has made the market more investable, but many wonder if the bull run has fueled adoption more than actual demand for the products. DeFi platforms profit share with liquidity providers and, therefore, have much lower profit margins than applications like OpenSea and Axie Infinity. However, during the last quarter Token Terminal updated OpenSea's earnings to reflect royalties paid to artists, bringing profit margins down significantly from Q3 calculations.

Annual Dapp Revenue and Earnings



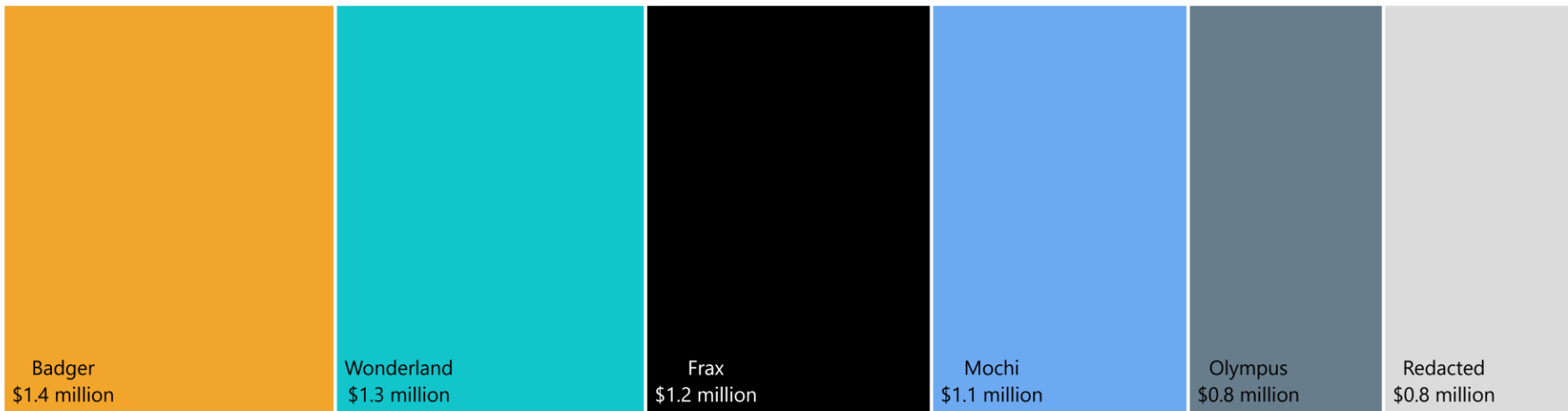
Curve Wars

The Curve ecosystem has expanded both horizontally and vertically, with “money legos” Convex, Yearn and Redacted building applications on top of the DeFi cornerstone. Horizontally, Curve is expanding from a stablecoin swap platform to a full, concentrated liquidity, volatile asset DEX. As volume increases and stablecoin issuers fight for CRV incentives, Curve voting power becomes ever important in the DeFi landscape. CRV emissions are slowing and some of the largest DeFi protocols are competitively accumulating assets with voting power of Curve in what is referred to as the Curve Wars.

Protocols Fight for Curve Voting Influence Through CRV and CVX

Six Protocols Own 14% of CVX Supply

Badger Wonderland Frax Mochi Olympus Redacted



Token Emissions vs Revenue

Lending protocols and decentralized exchanges have traditionally been reliant on token emissions to generate sufficient liquidity for users to borrow and trade against. Sushi famously “vampire attacked” Uniswap by launching a reward token to attract the deepest possible TVL.

In recent months, the downside of liquidity mining has become more apparent and DeFi tokens have struggled to keep up with the general market. If DeFi assets continue to fall in price, will protocols be able to retain users in the medium to long term?

Compound Markets - Macro Overview

Compound Quarterly Metrics	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021
<i>(\$ in millions)</i>						
Key Performance Indicators						
Outstanding Loans	\$359.0	\$1,057.3	\$1,754.0	\$5,490.5	\$3,546.1	\$5,565.9
% Growth		194.5%	65.9%	213.0%	(35.4%)	57.0%
Outstanding Deposits	981.6	1,849.9	2,873.9	12,018.1	9,590.1	14,195.2
% Growth		88.5%	55.4%	318.2%	(20.2%)	48.0%
Outstanding Originations	1,578.8	7,487.5	4,906.9	18,283.1	24,864.3	16,796.6
% Growth		374.3%	(34.5%)	272.6%	36.0%	(32.4%)
Quarterly Deposits	3,288.4	11,631.3	13,716.3	60,462.6	70,197.0	38,363.5
% Growth		253.7%	17.9%	340.8%	16.1%	(45.3%)
Liquidations	3.1	27.8	108.2	160.3	332.9	26.7
% Growth		796.8%	289.2%	48.2%	107.7%	(92.0%)
Aggregate Utilization	36.6%	57.2%	61.0%	45.7%	37.0%	39.2%
Financials						
Total Interest Income	\$2.4	\$12.4	\$20.6	\$88.0	\$96.3	\$77.6
Interest Expense (Interest to Depositors)	(2.1)	(11.2)	(18.7)	(77.7)	(85.4)	(68.6)
Net Interest Income (Reserve Factor)	\$0.4	\$1.2	\$1.9	\$10.3	\$10.9	\$9.0
% Growth						
Grants Paid	\$0.0	\$0.0	\$0.0	\$0.0	(\$0.6)	(\$0.1)
Net Income	\$0.4	\$1.2	\$1.9	\$10.3	\$10.3	\$8.9
% Margin	15.7%	9.9%	9.0%	11.8%	10.7%	11.5%
Token Incentives Paid	(\$8.7)	(\$36.8)	(\$22.4)	(\$65.4)	(\$90.5)	(\$75.8)
Adjusted Net Income	(\$8.3)	(\$35.5)	(\$20.5)	(\$55.0)	(\$80.2)	(\$67.0)

Source: [State of Compound Q3 2021 | Messari](#)

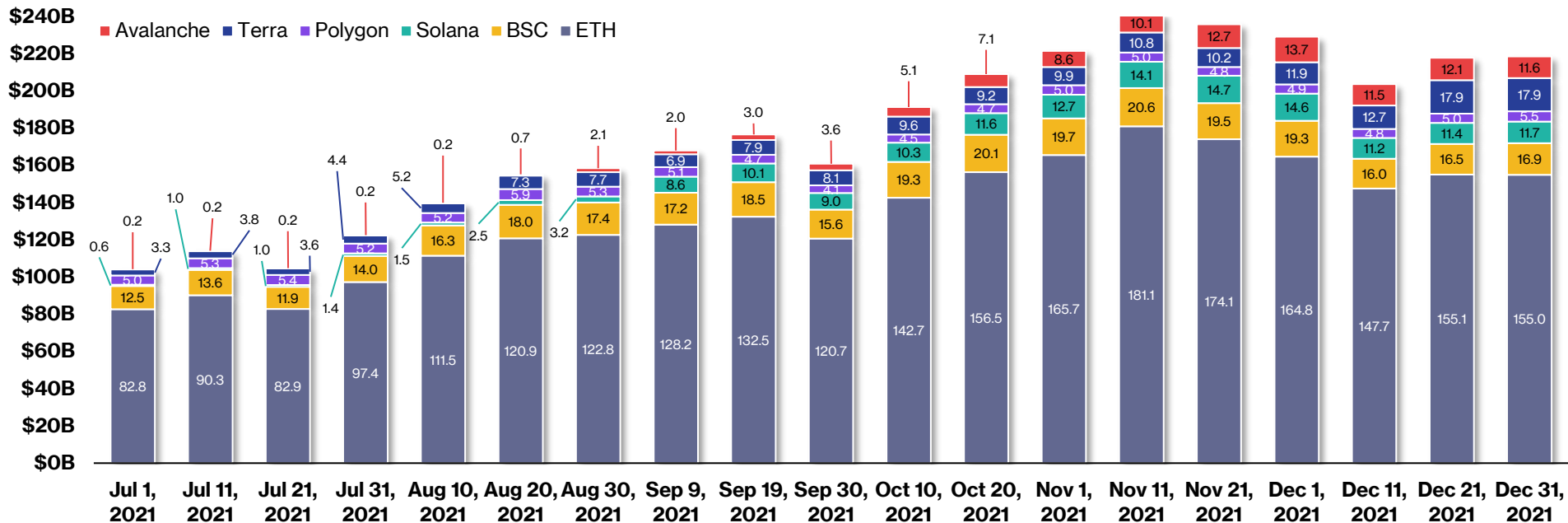
2021 Annual Review

Multi-Chain Ecosystem

Chain-Specific DeFi TVL

Last quarter, we noted the migration of capital to Solana and Avalanche as each chain acquired a slew of new users in the second half of 2021. Trends continued during Q4, with Avalanche and Terra now showing the strongest DeFi adoption, adding a combined \$17.85 billion to TVL over the quarter. While Ethereum layer 2 platforms continue to open the gates for developers, users have visibly favored alternative layer 1s. The lack of native tokens has seemed to limit user acquisition and retention on rollups like Arbitrum and Optimism.

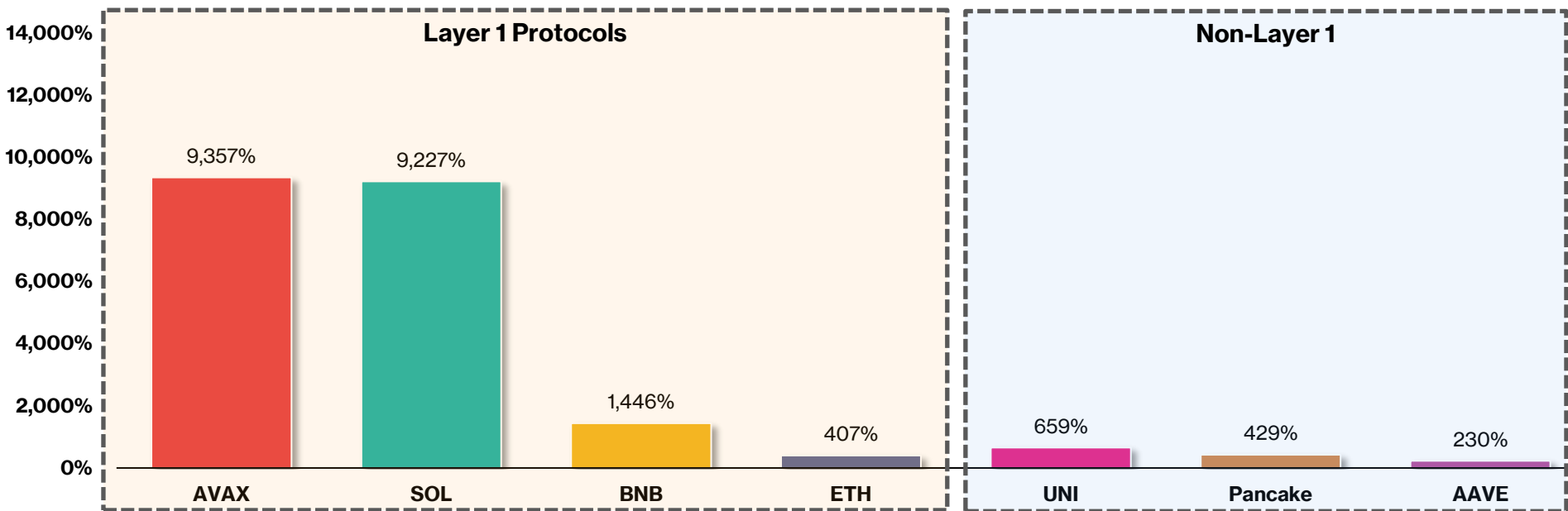
Terra and Avalanche Show Strong TVL Growth in the Back Half of 2021



Fat Protocol Thesis

Demand for DeFi has grown by multiples throughout the calendar year with applications like Aave, Maker and Curve all using over \$20 billion worth of crypto assets. Popular applications continue to deploy cross-chain, making services more accessible through lower transaction fees and ultimately attracting new sources of capital and revenue. Regardless of the success of top DeFi protocols, respective governance tokens have struggled to perform throughout 2021. Shown below, layer 1 native tokens have outperformed governance by multiples and appear to have a much higher ceiling than the applications built on top of them.

Top Layer 1s Outperform DeFi



Ethereum – 2021 in Review (cont.)

NFTs

NFTs were arguably responsible for the bulk of Ethereum adoption during 2021 as artists, athletes and celebrities piled into the space. After reaching \$633 million in trading volume during the first half of the year, OpenSea's trading volume hit over \$3 billion in both August and December.

Since the peak of NFT mania in the late summer, volume fell each month. However, activity returned in December as interest in the sector grew – a trend that is likely to continue. Gaming, sports collectables and other ideas began to take off, and active addresses climbed, signalling new users were beginning to trade the digital art and collectables. Furthermore, FTX and Coinbase announced centralized marketplaces for NFT trading, removing the need for high transaction fees and self-custody.

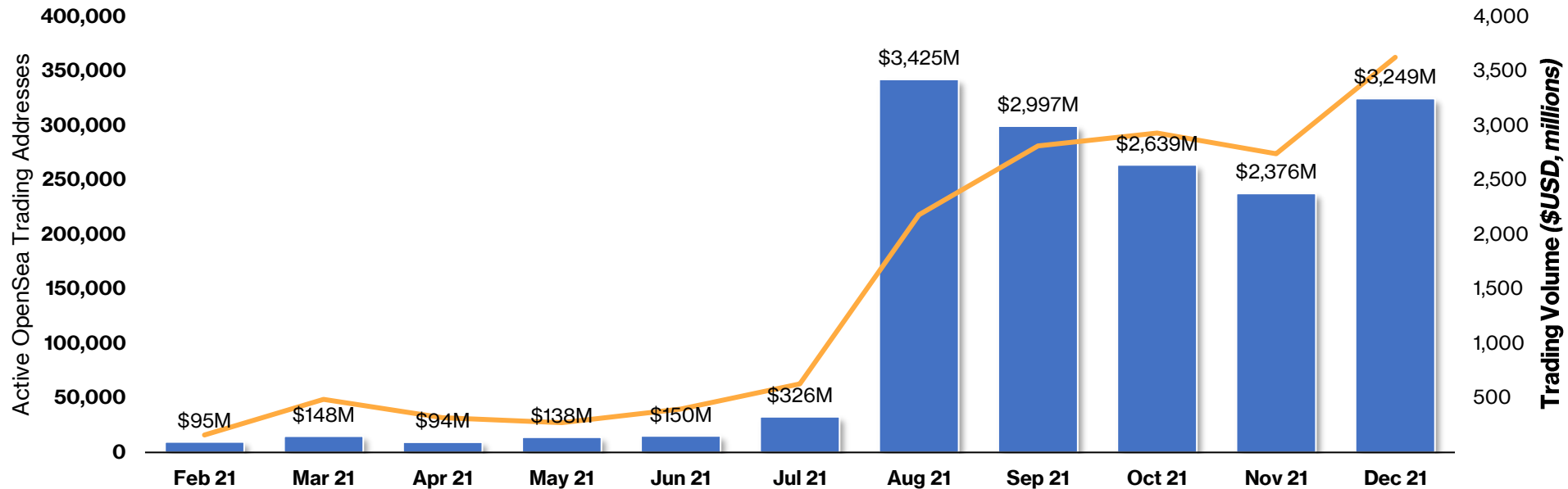
Blockchain gaming continued to show early signs of adoption as Axie Infinity remained popular and DeFi Kingdoms brought thousands of users onto Harmony to play within the quickly growing ecosystem. DeFi Kingdom also gave us a glimpse into the potential integration of DeFi and gaming.

For a brief period, CryptoPunks behaved as if they were the one and only blue-chip NFT. However, late in Q4 the Bored Ape Yacht Club valuation and floor price flipped Punks and demonstrated the unpredictability of the overall market.

NFT Trading Volume

On-chain NFT trading volume rebounded strongly in December after starting Q4 in a downtrend. OpenSea did a total of \$8.26 billion in volume during Q4, and unique address growth continued to trend positively both on Ethereum and on Polygon. While high gas fees, centralized marketplaces (FTX and Coinbase soon) and alternative chains may have pulled some attention away from OpenSea, the marketplace appears to have retained a strong demand for mainnet NFT trading.

OpenSea Volume Begins New Uptrend in December



Capital Raises & Business Developments

Capital Raises – 2021 in Review

2021 was a monumental year for capital raises and funding rounds in for blockchain and cryptocurrency companies. This section was co-authored with [Blockdata](#), a blockchain data and research company.

The following created a new, attractive investment profile for crypto companies in 2021:

- Total venture funding in blockchain companies in 2021 was **\$21.37B**, while in 2020 it was just **\$3.6B**, a 500% increase.
- Total volume of crypto payments **increased 100% over 2021**.
- Total NFT sales increased from \$340M in 2020 to \$17.7B in 2021, about a **5,100% increase**.
- El Salvador made **bitcoin legal tender**.
- Coinbase, Bakkt and others **went public through a direct listing and SPAC merger**.
- **Bitcoin surpassed PayPal** in terms of quarterly volume processed by 61%.
- About **\$250B was secured by the top 8 crypto custody providers** in 2021.
- 81% of top 100 institutions worked with blockchain technology.
- Stablecoin supply increased from **\$5.38B to \$148B** in December, a 26.5x increase in just under a year.
- As of 2021, there are **53 active blockchain consortia**.
- As of 2021, there are about **300M cryptocurrency users worldwide**.
- 55% of the top 100 banks made **investments into blockchain**.

Please note that funding data only includes **direct equity raises** and does not include token investments.

Venture Funding

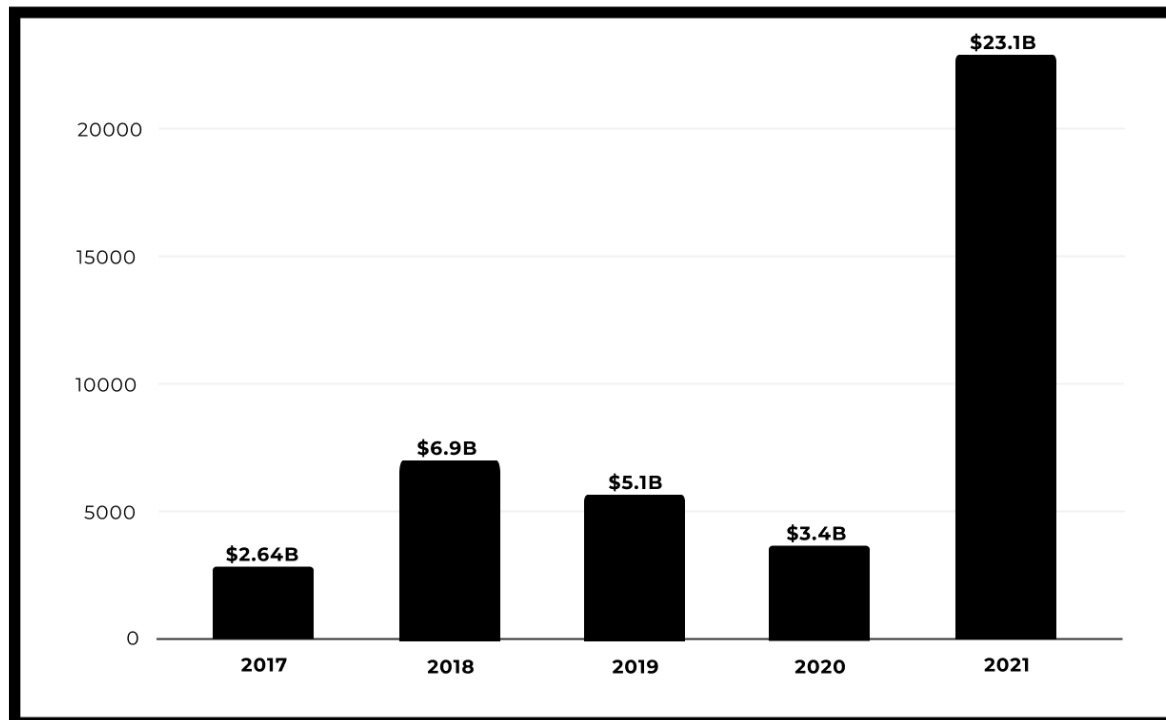
Practical application of blockchain technology and a growing crypto market drew massive interest from venture funds during 2021.

A similar trend was seen on a much smaller scale during 2018, but funding died off during the following multiyear bear market.

DeFi, NFTs and the demand for products built around Bitcoin are all more recent drivers of crypto adoption, which may help increase the longevity of venture funding.

BLOCKDATA

**VENTURE FUNDING RAISED BY
BLOCKCHAIN & CRYPTO COMPANIES**



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Source: [Blockchain & Crypto in 2021 | Blockdata](#)

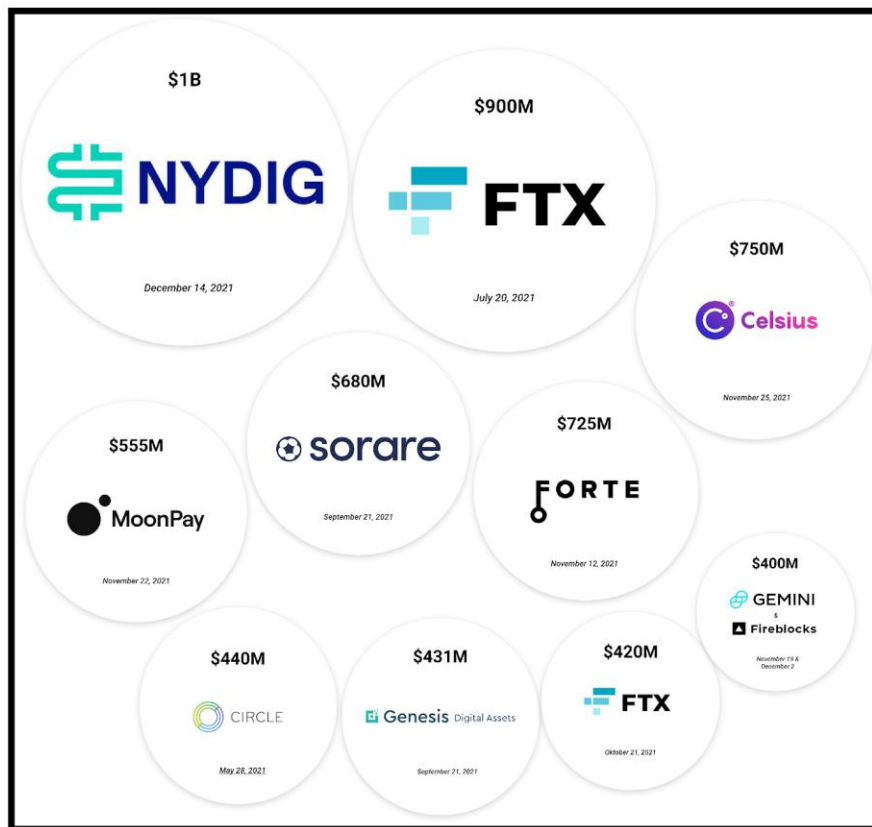
2021 Annual Review

Large Funding Rounds

NYDIG, FTX and Celsius topped 2021's largest funding rounds as crypto unicorns became the new norm.

While FTX's largest funding round was \$900 million at an \$18 billion valuation, the exchange raised another \$420 million in October, pushing its new valuation to \$25 billion.

Even the largest capital raises seemed to be spread across several subindustries of crypto, including exchanges, lending platforms, stablecoin issuers and financial services firms.



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Source: [10 Biggest Funding Rounds Ever | Blockdata](#)

2021 Annual Review

Top Funded Subindustries

Cryptocurrency and DLT is inevitably becoming a very broad industry as funding is spread evenly across sectors with contrasting business models.

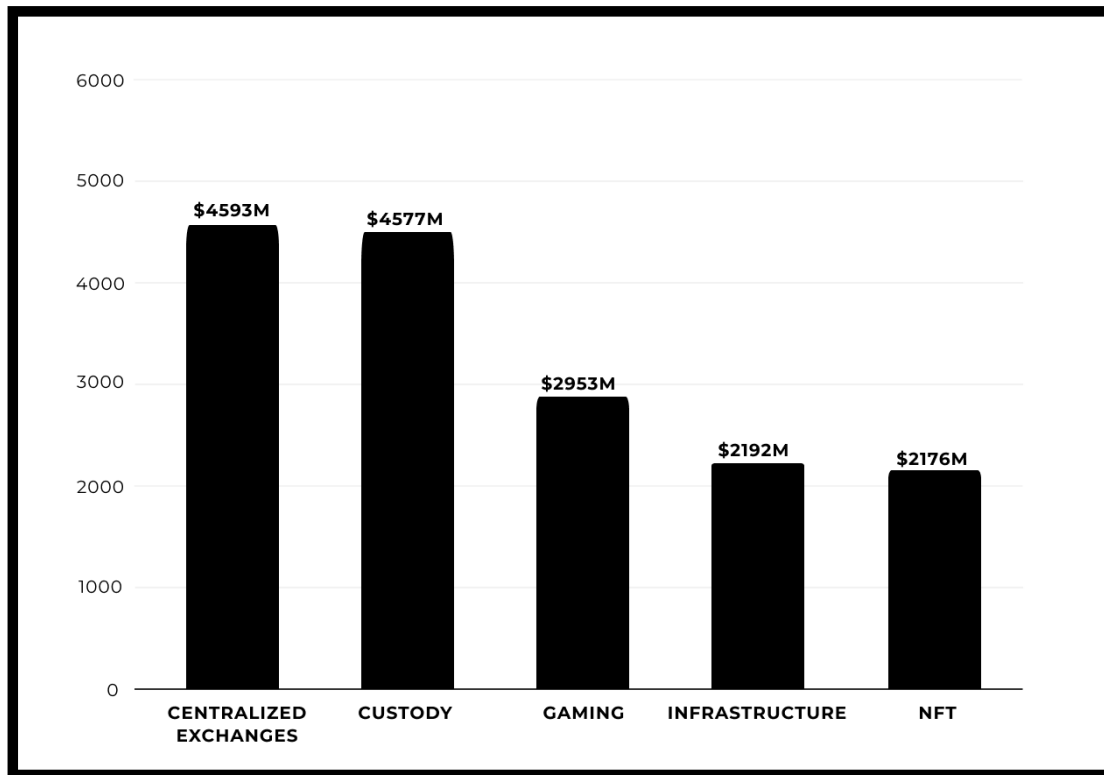
Centralized exchanges drew the most attention from investors, mostly thanks to FTX and Gemini.

Gaming and NFT-focused companies gained traction during the back half of 2021 as OpenSea and Axie Infinity highlighted the strong demand for blockchain-based entertainment.

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TOP 5 BLOCKCHAIN USE CASES BY FUNDING

DURING 2021



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Source: [Blockdata](https://www.blockdata.tech)

2021 Annual Review

Funding by Geography

U.S.-based companies made up 57.5% of all blockchain company funding during 2021. The next tier of funding landed in Canada, France, the United Kingdom and Hong Kong.

With seven of the top eight funds responsible for crypto-focused investing, the United States appears to be making the biggest push into the emerging industry.

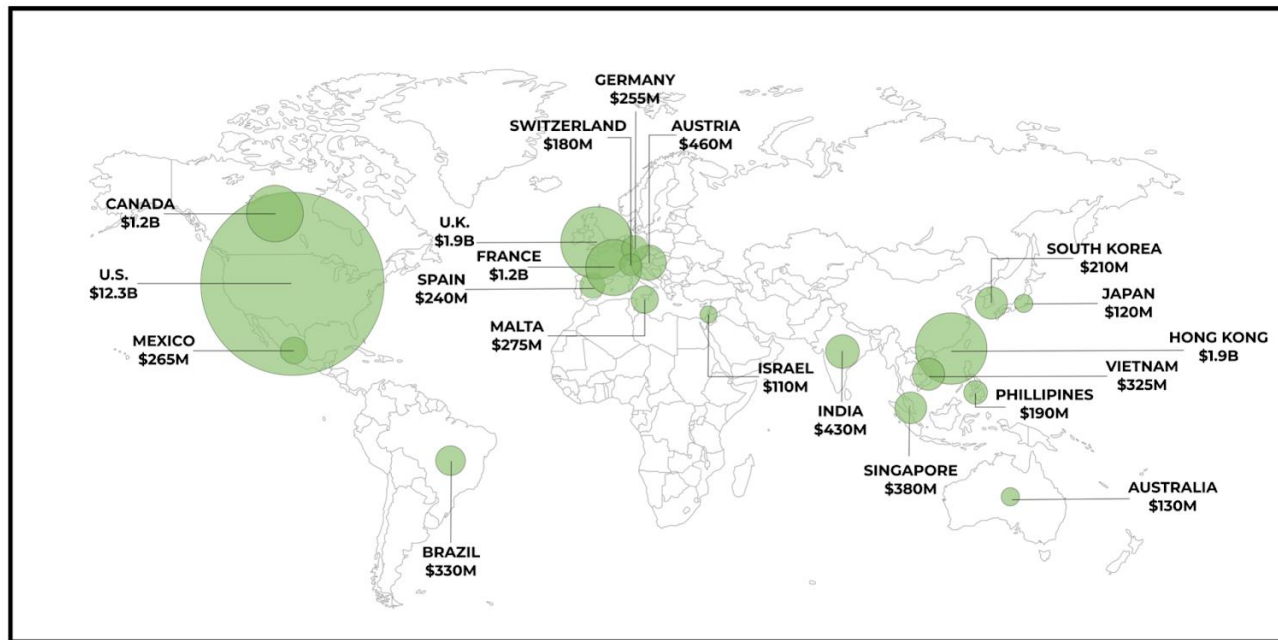
According to Blockdata, Coinbase Ventures, au21, Andreessen Horowitz, Pantera Capital and Paradigm were all in the top eight most active crypto venture funds.

However, it is important to note that the capital raises in this section are specific to crypto companies. When looking at DeFi raises and coin offerings, U.S. regulatory agencies have held investors back from accessing presales and public launches.

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VENTURE FUNDING RAISED BY BLOCKCHAIN COMPANIES PER COUNTRY

DURING 2021



* data only includes equity funding, and no ICOs, IPOs or token sales. Only the top 20 countries (based on funding) are shown.

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Source: [Blockchain Venture Funding per Country | Blockdata](#)

2021 Annual Review

Top Funded Industries

Looking at all the funding by blockchain companies this year to date, Blockdata found that the most funded industry is Distributed Ledger Technology (focusing on infrastructure, blockchain development platforms, layer solutions and protocols), which is accountable for 18.8% of all blockchain-related funding, totaling \$12.8 billion.

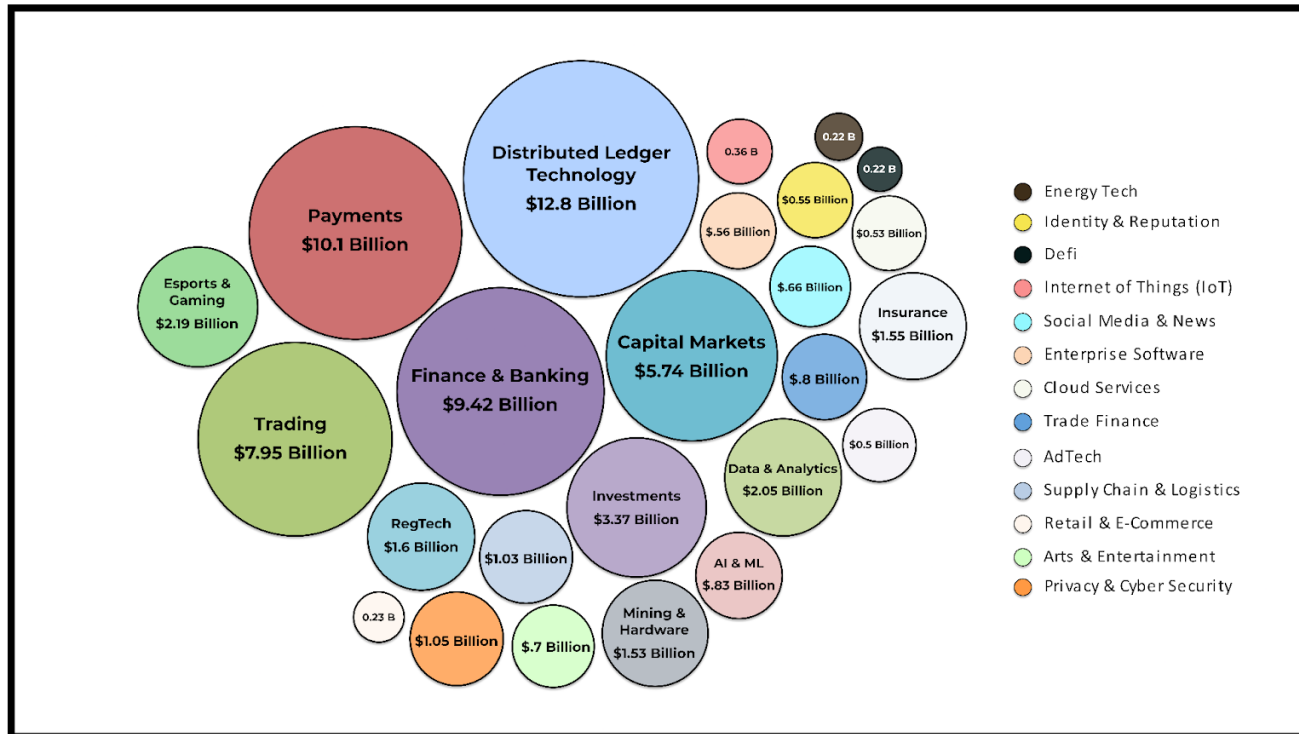
This is followed by:

- Payments, by 334 companies, totaling \$10 billion in funding
- Finance & Banking by 391 companies, totaling \$9.42 billion
- Trading by 289 companies, totaling \$7.95 billion
- Capital markets by 251 companies, totaling \$5.7 billion.

These top five industries make up about 67.5% of all blockchain-related funding as of 2021.

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TOP 25 MOST FUNDED INDUSTRIES IN BLOCKCHAIN / CRYPTO (2021)



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Source: [Blockchain & Crypto in 2021 | Blockdata](#)

2021 Annual Review

Regulation

Regulation – 2021 in Review

2021 was also a monumental year in the arena of regulation. The majority of this section will be U.S.-focused and will gloss over many granular details. For a weekly policy-focused roundup examining the intersection of cryptocurrency and government, subscribe to CoinDesk's [State of Crypto newsletter](#).

We began the year with Joe Biden entering the White House, replacing Donald Trump. Trump, despite admitting he was not a fan of bitcoin, appointed regulators and pursued policies that undeniably boosted the crypto industry. The main U.S. agencies that have an interest in the crypto sphere are the Securities and Exchange Commission (SEC), Commodity Futures Trading Commission (CFTC) and the Office of the Comptroller of the Currency (OCC). After four years, here's what Trump's administration left behind.

- SEC - In short, almost all of the SEC's actionable guidance came via enforcement actions and informal warnings. What is clear is a) token sales may violate securities laws and b) the SEC will go after entities if it thinks there's a violation.
- CFTC - During the Trump era, the agency approved the entrance of crypto derivatives products in the U.S., creating a regulated trading market in which institutions could participate.
- OCC - The OCC wasn't hugely involved in the crypto space for most of Trump's term, outside of a [legal fight over a fintech charter](#). It wasn't until Brian Brooks got to the agency by way of [an appointment by Treasury Secretary Steven Mnuchin](#) that the OCC really began making public moves relevant to the industry.

The rest of the section will provide a chronological list of CoinDesk policy articles from 2021 that outline the main topics of the year.

Regulation – 2021 in Review (cont.)

[Gary Gensler Named as Joe Biden's SEC Chair Pick | January 2021](#)

[India Proposed Legislation to Ban Private Cryptocurrencies | January 2021](#)

[Nigeria's Central Bank Orders Banks to Close Accounts of Crypto Users | February 2021](#)

[Ontario Securities Commission Approved North America's First Bitcoin ETF in Canada | February 2021](#)

[IRS Seeks Names of Circle Customers Transacting Over \\$20K in Crypto | April 2021](#)

[Coinbase Goes Public via Direct Listing | April 2021](#)

[China Calls for Crackdown on Crypto Mining and Trading | May 2021](#)

[Biden's 2022 Budget Includes New Crypto Reporting Proposals | May 2021](#)

[Congressional Hearings Begin Ramping Up | June 2021](#)

Regulation – 2021 in Review (cont.)

[Global Regulators Announced Warnings Around Binance, the World's Largest Crypto Exchange | July 2021](#)

[Presidential Advisory Group Promises Stablecoin Recommendations | July 2021](#)

[Congress Holds 3 Crypto Related Hearings In One Day | July 2021](#)

[\\$1 Trillion Infrastructure Bill Hung Up In Part Due To A Crypto Tax Provision | August 2021](#)

[US Sanctions Enforcer Blacklists a Crypto Exchange for First Time | September 2021](#)

[ProShares Bitcoin Strategy EFT \(BITO\) Becomes First Bitcoin ETF To List On The NYSE | October 2021](#)

[President's Working Group Stablecoin Report is Released | November 2021](#)

[The SEC Continues To Reject Spot Bitcoin ETF Applications | November 2021](#)

[Senator Lummis to Propose New Crypto Regulator, Clear Guidance in 2022 Bill | December 2021](#)

Thank you for reading!

CoinDesk Research is [George Kaloudis](#) and [Teddy Oosterbaan](#).

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