

Cryptocurrency

Web3: Only the first inning

04 May 2022

We provide an overview of the emerging Web3 ecosystem, as well as an updated version of our redacted 141-page report published on October 4, 2021.

Key Takeaways:

- Digital assets are the building blocks of Web3 and enable creators on the internet to monetize their contributions
- We expect Web3 applications to bring more monetary balance between dominant platform operators and their users
- The Web3 ecosystem of applications may provide the catalyst for the first billion digital asset users

Web3 has arrived – on-ramp to the first billion users

With digital plots of land selling for \$2mn+, digital yachts selling for \$650k and Gucci digital clothing for sale, Web3 has arrived. This expansive ecosystem of applications could provide the on-ramp for the first billion digital assets users and more, up from 300mn+ today.¹ The metaverse has captured outsized attention as potential users envision interacting virtually. Sales of digital land and collectibles have reached ~\$1.2bn from ~85k unique buyers since 2020, but Web3 is so much more than just the metaverse.²

Web3 is an umbrella term that encompasses the shift from a centralized to a decentralized internet, where internet renters become owners. Even an eventual semi-decentralized internet is a win in our view. Web3 will look and feel like Web2 in its final state, but content creation, governance, trust and ownership will differ substantially.

Web3 applications have the potential to transform traditional industries, including advertising, browsers, finance, gambling, gaming, insurance, legal, messaging, music/video streaming, retail, social media, storage and venture capital. New applications and projects are launching every day, but mainstream adoption of digital assets and Web3 applications requires time and development, which we anticipate will occur over the next five to ten years.

Internet renters become owners

In Web2, individuals rent access to company-owned (centralized) platforms in exchange for personal data and ownership of their creations, but incentives change when platforms are owned by their users, instead of profit-maximizing corporations. An emerging Web3 ecosystem of applications where users generate content on community-owned (decentralized) platforms and retain privacy, ownership of their creations and profits is being built (Exhibit 1).

We expect Web3 applications to shift the balance of power and profits from platform operators to platform users and disrupt traditional industries through gradual market share capture as the transition to a semi-decentralized ecosystem accelerates. A fully decentralized, software-based economy is unlikely any time soon, or ever, but a company's ability to profit from user-generated content through rent-seeking will likely decrease

¹ Crypto.com's Measuring Global Crypto Users

² NonFungible

Exhibit 1: Web2 to Web3 – the transition from internet renters to owners

Web1 through Web3 from the perspective of content generation, governance, trust, ownership and profit

	Web1 1990 – 2004	Web2 2004 – Present	Web3 Present – ???
Content Creation	Platform Operators Create	Platform Users Create	Platform Users Create
Governance / Control	Platform Operators Govern	Platform Operators Govern	Platform Users Govern
Trust	Non-Verifiable	Non-Verifiable	Verifiable
Ownership	Platform Operators Own	Platform Operators Own	Platform Users Own
Profit	Platform Operators Profit	Platform Operators Profit	Platform Users Profit

Source: BofA Global Research

Blockchain tech and digital assets – the building blocks

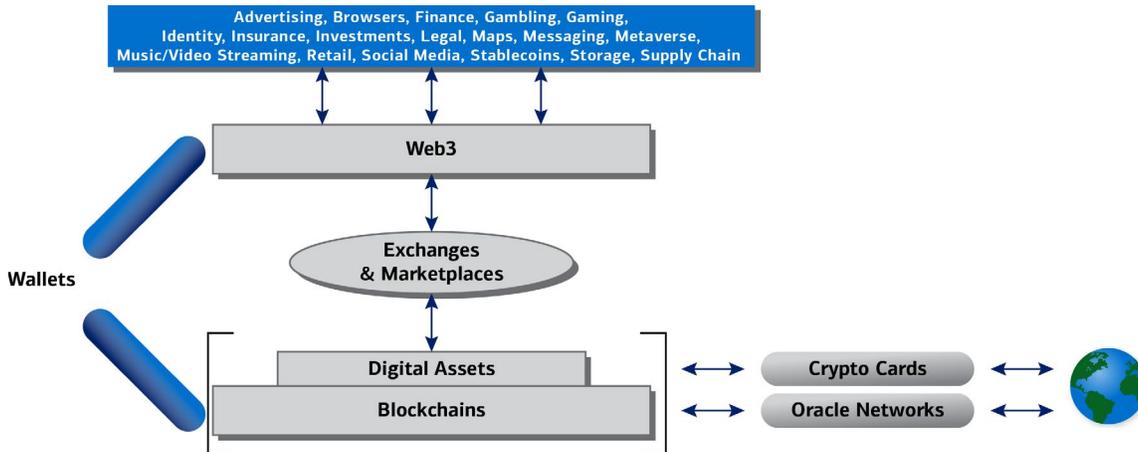
We view blockchains and digital assets as the building blocks for the emerging Web3 ecosystem and expect blockchain technology to be the most significant evolution of software since the internet.

Blockchains like Ethereum, Solana and Avalanche act as operating systems on which Web3 applications can be built. However, mainstream adoption of Web3 applications also requires a crypto-native ecosystem, in which individuals are unaware of applications’ leveraging blockchain technology and no longer differentiate between fiat and crypto ecosystems. Applications like exchanges and non-fungible token (NFT) marketplaces create bridges between the digital asset ecosystem’s blockchain and application layers as oracle networks and crypto cards create links between the fiat and digital asset ecosystems (Exhibit 2).

Web3 cannot exist without scalable, decentralized and secure blockchain operating systems, bridges to connect blockchains to marketplaces and the metaverse, as well as links to the real world. Only when all of these elements are in place will a global network of users be able to seamlessly buy a specific suit as an avatar skin for their digital self to wear in client meetings or sell swords won while gaming.

Exhibit 2: Web3 applications are exciting, but don’t forget the bigger picture

Blockchain technology and digital assets – the building blocks for the Web3 ecosystem



Source: BofA Global Research

Note that some Web3 applications are accessible in the metaverse.

Disruption potential accelerates

The Web3 ecosystem is an evolution in which companies are replicated by applications leveraging rules-based software and community governance. The benefits of Web3 applications are clear: blockchain technology creates efficiencies and lowers costs by removing intermediaries from lawyers to bankers to social media companies. Disruption potential is high, but we wouldn’t replace equity allocations with metaverse tokens just yet.

Web3 applications will likely operate in tandem with Web2 companies, but the utopian (or dystopian) concept of a fully decentralized economy in which the role of companies is limited or removed is unlikely. Instead, Web3 applications and the future crypto-native ecosystem will likely be semi-centralized, given that regulators can’t hold software accountable. It’s also unlikely that community-governance through Decentralized Autonomous Organizations (DAOs) or with governance tokens will survive regulatory scrutiny. We expect Web3 applications that gain mainstream adoption and usage to capture market share from traditional industries over time.

WAGMI, but we're not there yet

Despite 18k+ monthly active developers working on Web3 projects at the end of 2021, +80% y/y, today's Web3 ecosystem is in very early innings.³ We are fascinated by the futuristic Web3 applications like the metaverse, but more focused on how blockchains are differentiating themselves by optimizing the underlying software for specific use cases and the development of bridges and links that are essential to the formation of a crypto-native ecosystem (Exhibit 3).

Significant improvements to user experience are needed and, without development, the user experience won't develop beyond one that resembles The Sims. We're all going to make it (WAGMI), but patience is needed before Web3 applications like Grape threatens Instagram, Audius threatens Spotify, Arbol threatens State Farm, Brave threatens Chrome, Hivemapper threatens Google Maps and before your next trip to Vegas is replaced by a trip to the ICE Poker tables in Decentraland.⁴

Exhibit 3: Web3 is more than just the metaverse

Web3 vs the Metaverse

Web3	Metaverse
A new model for building blockchain-based businesses and networks owned and governed by users	The next platform after smartphones where users can interact in virtual spaces powered by Web3

Source: BofA Global Research

The investment case – wake me up in five years?

The digital asset ecosystem, including Web3 applications, is too large to ignore, in our view. Institutional and retail investors, as well as corporates, all need to prepare. We expect significant market value expansion over the next five to ten years, but the value created will likely be far more distributed than in the past. Companies frequently remain private for longer and conduct their IPO (initial public offering) at increasingly high valuations, but the value creation is usually concentrated in the hands of a few individuals (Exhibit 4).

The difference now is that institutional and retail investors can purchase tokens, representing ownership in a network, before the significant market value expansion that we expect occurs. Bitcoin was never a private network, nor are the other 80 tokens valued at \$1bn or more. New blockchains and applications are likely to emerge and poorly positioned ones will exit, creating significant upside potential for some and downside for others.

Exhibit 4: Companies are remaining private for longer and IPO'ing at higher valuations

Facebook remained private for 8 years and IPO'd at \$104bn

	Microsoft	Apple	Dell	Amazon	Google	Alibaba	Facebook	Uber	Rivian
Founded	1975	1976	1984	1994	1998	1999	2004	2009	2009
IPO	1986	1980	1988	1997	2004	2014	2012	2019	2021
Years Private	11	5	4	3	6	15	8	10	12
IPO Valuation	\$777mn	\$1.7bn	\$85mn	\$438mn	\$23bn	\$168bn	\$104bn	\$76bn	\$77bn

Source: BofA Global Research

We see limited corporate interest today in holding bitcoin or other digital assets on the balance sheet, potentially due to a lack of regulatory and tax-accounting clarity, but expect brands across every industry to increasingly incorporate Non-Fungible Tokens (NFTs) into their marketing strategies to drive customer engagement, a trend that could accelerate as privacy rules are implemented around the world and third-party cookies are phased out.

NFTs are much more than expensive digital art and collectibles and companies, including Fortune, Rolling Stone, The Economist and Vogue, have launched NFTs of past magazine covers. TIME has taken the next step by transforming NFT buyers into loyal customers and community members by turning NFTs into loyalty cards with perks. We expect the data collected to improve awareness of customer interests, which could increase the potential for community engagement, ultimately producing sticky revenue streams. A thoughtful NFT strategy can drive incremental revenue today, but also in perpetuity.

³ Electric Capital

⁴ WAGMI, or We're All Gonna Make It, is a phrase used throughout the crypto community to express optimism for the digital asset ecosystem's long-term adoption and development.

Digital Assets: An emerging asset class

Digital asset sector too large to ignore; not just bitcoin, so much more

With a ~\$1.7tn market value and 300mn+ users, the digital asset universe is too large to ignore, in our view.⁵ We believe digital assets could form an entirely new asset class. Bitcoin is important with a market value of ~\$718bn, but the digital asset ecosystem is so much more: blockchains that act like operating systems, decentralized applications (DApps) without middlemen, NFTs enabling connections between creators and fans, stablecoins pegged to fiat currencies and central bank digital currencies (CBDCs) to replace national currencies. Venture Capital blockchain/digital asset investments were ~\$30bn in 2021, dwarfing the prior year's ~\$5bn.⁶ This creates a new generation of companies for digital assets trading, offerings and new applications across industries.

Welcome to the token economy

Bitcoin was designed as money, but is increasingly viewed as “digital gold.” Ethereum created a generalized platform powered by smart contracts, enabling the development of hundreds of applications that could transform industries. Digital assets that enable applications to be built, like the Apple iPhone did with its App Store, are gaining the most value. Our view is that there could be more opportunity than skeptics expect. In the near future, you may use blockchain technology to unlock your phone; buy a stock, house or fraction of a Ferrari; receive a dividend; borrow, loan or save money; or even pay for gas or pizza.

DApps and NFTs: the most innovation

Decentralized Finance (DeFi) is an ecosystem of applications that allows users to utilize financial products and services, such as lending, borrowing, insurance and trading, without relying on traditional financial institutions. DApps may bring financial services to many of the 1.7bn unbanked globally through a simple smartphone app. NFTs are changing the way creators connect with fans and receive compensation. NFT sales were ~\$3.5bn in Apr'22, up from ~\$100mn in Apr'21 and ~\$250mn in all of 2020, led by demand from celebrities, corporations and individuals (Beeple's NFT sale at Christie's for \$69mn was a catalyst, for example).⁷

Risk: regulation coming to the Crypto Wild West

Increased adoption of cryptocurrencies, new blockchain-based applications and stablecoins that could be used as money are drawing attention globally. Governments are working to develop policies and, as the Securities and Exchange Commission (SEC) said, the digital asset industry's future lies “in the public policy framework.” DeFi applications with security-like features may draw regulatory attention, likely pressuring near-term adoption. Regulatory uncertainty is the largest near-term risk in our view, but regulation may drive increased investor participation over the long term once the “rules of the road” for digital assets are established.

⁵ All data as of the end of April 2022 unless noted otherwise. ~\$1.7tn market value from CoinMarketCap.

⁶ Cointelegraph

⁷ Dune Analytics (<https://dune.xyz/rchen8/opensea>), NonFungible

Bullish on long-term prospects

At ~\$1.7tn, the digital asset ecosystem aggregate market value is now larger than the gross domestic product (GDP) of Canada or South Korea. We expect further value creation as bitcoin is increasingly adopted, alternative tokens enable new applications and a pipeline of Venture Capital-backed private companies reaches public markets. Despite potential regulatory headwinds (maybe tailwinds ultimately), we are bullish on the long-term prospects for the digital asset ecosystem as it enters the mainstream. We anticipate significant growth as digital asset use cases move beyond bitcoin's store of value thesis to an industry characterized by product innovation, regulatory clarity, increased institutional participation and mainstream adoption.

It's difficult to overstate how transformative blockchain technology, digital assets and the thousands of decentralized apps that have yet to be created could potentially be. We expect rapid changes to the current market structure – new use cases will be discovered and others will be discarded.

We are bullish on the digital asset theme for the following reasons:

1. We are only in the first innings of a major change in applications across most industries that will take place over the next 30 years, in our view. Estimates indicate ~300mn users globally as of Jan'22 have traded a cryptocurrency or used a blockchain-based application, up from ~106mn users globally as of Jan'21.⁸
2. Due to technological advances in decentralized software that is native to the internet, a new medium – with distributed ledgers and blockchain at its core – is emerging rapidly. The applications built on this new software architecture appear to be growing more quickly than past technologies. New companies are likely to emerge and poorly positioned companies will exit, creating significant upside potential for some and downside for others.

While we acknowledge concerns about the speculative digital asset trading that takes place currently, we believe it's the underlying blockchain technology driving this speculation that could be revolutionary.

Diverse and thriving

Hundreds of companies are now within the digital asset ecosystem providing infrastructure support, marketplaces and applications. Many are just two quants in a garage, though Venture Capital funding jumped to ~\$30bn in 2021 and has accelerated in 1Q'22.⁹ We're still in the early innings, but see the potential for value creation over the next five years. However, as in prior tech cycles (PCs, software, internet...), only a handful of well-run, focused companies will likely succeed.

Governments & regulators are noticing

Increased adoption, new token-enabled blockchain-based applications and stablecoins that may act like money are drawing attention globally. Some governments, such as China's, have banned digital assets. Others, such as the US, are attempting to bring digital assets into a defined regulatory framework. We view a regulatory framework as critical for mainstream digital asset adoption and institutional engagement, but expect plenty of volatility along the way.

Corp interest growing; earnings call mentions increasing

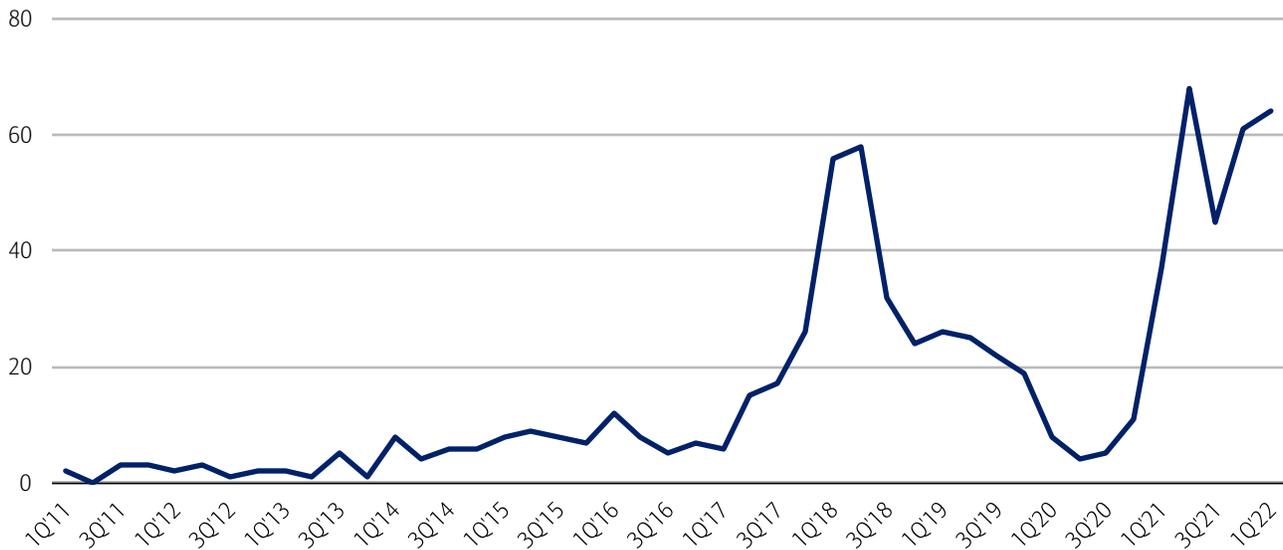
Increasing regulatory scrutiny as the digital asset ecosystem grows, and more individuals participate, may mean digital assets are a step closer to the end of their Wild West days. If so, corporations may in the future be more willing to consider adding digital assets to their balance sheets for diversification or to participate in the digital asset ecosystem by leveraging blockchain technology to make their businesses more efficient. Partnering with our BofA Predictive Analytics team, we used Natural Language Processing (NLP) to analyze 144,547 earnings call transcripts from 1Q'11 through 1Q'22, which found corporate interest in digital assets is near all-time highs (Exhibit 5).

⁸ Crypto.com's Measuring Global Crypto Users

⁹ Cointelegraph

Exhibit 5: Number of US companies that mentioned a digital asset keyword* on an earnings call rose to 238 from 57 a year ago

NLP analysis of earnings call transcripts of US-listed companies; avg 3,212 transcripts reviewed per quarter



Source: FactSet, BofA Global Research

*Keywords include: altcoin, bitcoin, blockchain, crypto, cryptocurrency, decentralized finance, defi, ether, ethereum, NFT, non-fungible-token

Year-over-year calculation period: 2Q'20 – 1Q'21 and 2Q'21 – 1Q'22 through 3/31/22.

Bitcoin leading the way

Bitcoin is a supply/demand commodity and remains the most valuable digital asset at an aggregate value of ~\$718bn. Bitcoin's price is up over 1.9x its 2017 high at ~\$38,000, as adoption by individuals increases, corporate managements begin due diligence and regulators across the US and Europe work to provide a framework that could bring digital assets into the mainstream. Key value drivers include scarcity given a fixed supply of 21mn tokens (~19mn are already in circulation), growing demand with the potential for regulatory clarity across the US and Europe to provide a tailwind and potential exchange-traded fund (ETF) approval timing. We expect bitcoin's market value to increase over the intermediate/long-term due to supply/demand dynamics.

But it's not just bitcoin; value of altcoins is rising

Crypto has evolved since bitcoin and its original payments use case. Tokens other than bitcoin are known as alternative coins or altcoins. There are now 19,000+ altcoins, although many do not have a clear use case. Key value drivers for the native tokens of blockchains and applications include user adoption, developer interest and a clear use case; tokens without adoption, development and a clear use case are not likely to survive except as novelties.

Decentralized finance/applications and regulatory trends

Ethereum, Solana, Avalanche and other blockchains can do more than securely record payments (Bitcoin's strength), such as executing automated programs (smart contracts). This is DeFi, in which smart contracts automate manual processes of traditional finance, such as loans without a middleman (trusted intermediary). DeFi applications are a fast-growth segment of the digital asset ecosystem with Total Value Locked (a measure of the total value of tokens staked in DeFi applications) increasing to \$154bn in Apr'22 from \$104bn in Apr'21 and \$800mn in Apr'20.¹⁰ DeFi is an area that regulators are reviewing because tokens may be viewed as securities once they provide traditional financial services. We are optimistic about the long-term growth of this segment as it matures and regulatory uncertainty is clarified.

Non-fungible tokens (NFTs) – a surprise for all

The rise of NFTs caught even old-time digital asset players by surprise. NFT sales increased to ~\$3.5bn in Apr'22, up from ~\$100mn in Apr'21, driven by corporate, celebrity and individual demand.¹¹ NFTs are unique digital files created on the blockchain (immutable, transparent record) that usually contain data that point to an online version of art or a physical asset and ownership or certain rights.

¹⁰ DefiLlama

¹¹ NonFungible

NFTs are evolving with artificial intelligence (AI) and smart contracts being added to the code. NFTs can be used instead of deeds, titles or anything currently needed to demonstrate ownership – and all without a middleman charging a fee. With an embedded smart contract, NFTs can create perpetual royalty streams for the original creator; every time the NFT is sold, a percentage of the sale price can be sent back to the creator.

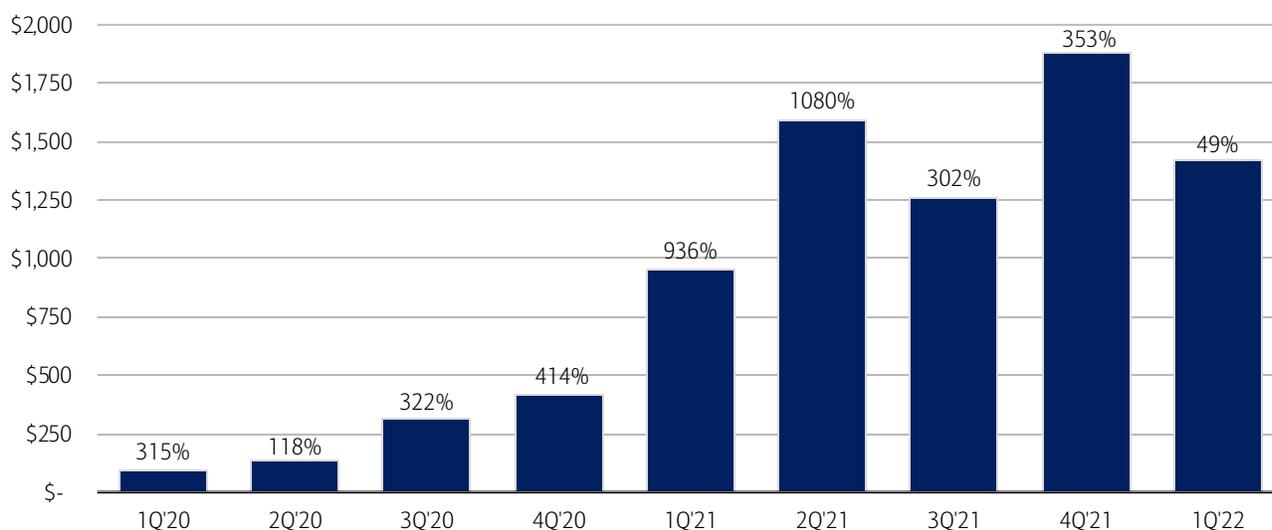
Stablecoins critical for digital asset applications, but bring risk

Stablecoins are digital assets pegged to another asset class such as a fiat currency (like the US dollar), a commodity (like gold) or other digital assets with the goal of maintaining a stable value. Digital asset holders and traders view stablecoins as the fiat currency of the digital asset ecosystem and use them to reduce exposure to more volatile digital assets, lock in gains from trading, transfer funds between exchanges or between exchanges and wallets and as a safe haven when expecting a downturn or during a pullback, similar to how a portfolio manager may rotate into cash. Stablecoin transaction volumes jumped to an average \$1.4tn per quarter in 2021, up from an average \$239bn per quarter in 2020 (Exhibit 6).¹² The top four stablecoins by market value – Tether, USD Coin, TerraUSD, Binance USD – have a market value of \$169bn, +127% y/y.¹³

Most stablecoins are not backed 1:1 with US dollars and, instead, partially use reserves such as commercial paper and/or corporate debt to provide extra yield to the stablecoin issuer, which creates the risk of forced liquidation if market conditions become illiquid or if there’s a broader market correction. If a top stablecoin by market value were to become unpegged, leading to panic and resulting in a stablecoin run, the implications would likely extend into traditional financial markets. Despite the size and growth of the stablecoin market, stablecoin issuers are not regulated under a comprehensive framework and provide varying levels of transparency into the composition of reserves that back their stablecoins. Our view is that the risk of a stablecoin run and the implications for traditional assets should not be ignored.

Exhibit 6: Stablecoin transaction volume has grown significantly

Stablecoin on-chain transaction volume from 1Q'20 – 1Q'22 (\$bns) and change in transaction volume y/y (%)



Source: Coin Metrics

Central Bank Digital Currencies (CBDCs) – when, not if

Inspired by digital assets and stablecoins, CBDC activity increased significantly in 2021 in an effort to create the next evolution of money. Central banks from countries that represent over 90% of global GDP are reported to be exploring CBDCs.¹⁴ Two of the world’s major currencies – the dollar and euro – are actively moving to the introduction of a CBDC, but China’s digital yuan (e-CNY) is in the lead following a pilot launch in Apr’20 and a broader rollout that coincided with the Winter Olympics. We anticipate a US CBDC to be issued between 2025 and 2030.

Potential benefits of a US CBDC include preserving the dollar’s status as the world’s reserve currency, improving cross-border payments (average cost to remit \$200 from the US was 5.4% of the transaction value in Q2’21), increasing financial inclusion (~5% of US households were unbanked in 2019) and leveraging new use cases provided by a digital currency. Potential risks

¹² Coin Metrics

¹³ CoinMarketCap

¹⁴ Atlantic Council

include changing the financial sector’s market structure by shifting deposits, increasing the liquidity risk of the financial system if deposits at commercial banks were converted to a CBDC and decreasing the efficacy of monetary policy implementation.

Digital assets & ESG – plans to shift to greener energy

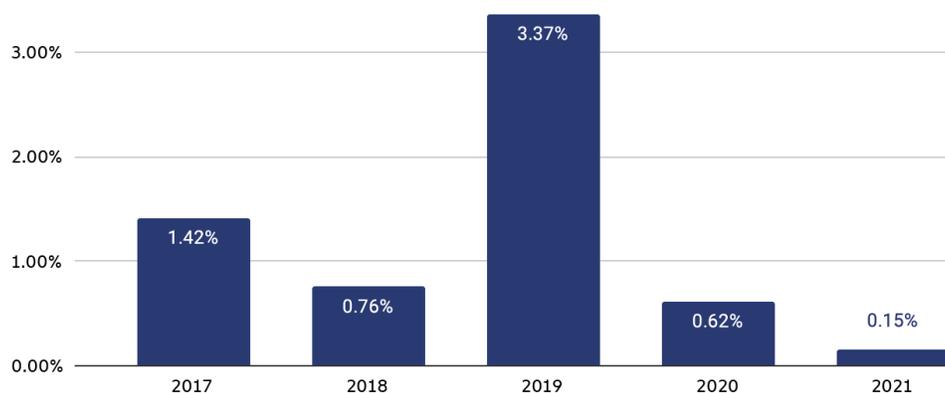
Mining digital assets uses a lot of resources. Many digital asset miners plan to shift to less energy-intensive forms of mining and to increase their use of greener/renewable energy. The current process of mining bitcoin consumes ~0.7% of global electricity consumption, which causes critics who believe that Bitcoin adds no value to argue that consuming as much electricity as Egypt or Norway is wasteful.¹⁵ Bitcoin supporters counter that ~60% of energy used is renewable and that the energy use is worth the consumption for the future value it will provide against the devaluation of fiat currencies.¹⁶ Supporters also point out that there are benefits to the electric grid provided through load balancing, where miners can sell back energy to the grid when demand is high.

Illicit activity concerns

Digital assets have a mixed reputation not least due to high-profile ransomware cases and their underlying foundation of anonymity. What we think is underappreciated is that the blockchain is permissionless and transparent, enabling on-chain analytics to track digital asset fund flows through multiple wallets and provide law enforcement with the ability to track criminals and other bad actors, as was done with the recent Colonial Pipeline ransomware event. Transactions associated with illicit activity dropped to ~0.15% of total transactions in 2021 from ~3% in 2019 and over 35% in 2012 (Exhibit 7).¹⁷ However, failure to reduce illicit activity, which represented \$14bn in 2021, could lead new and existing users to hesitate before purchasing tokens and potentially drive restrictive regulation down the road.

Exhibit 7: Illicit activity was associated with ~0.15% of crypto transactions in 2021

Percent of crypto transactions connected to illicit activity from 2017 – 2021



Source: Chainalysis

Risks: what could go wrong?

We summarize the key risks that could slow the adoption of blockchain technology and digital assets. We categorize these key risks as technology/adoption risk – the risk that characteristics of blockchain technology prevent broad adoption or development of use cases – and legal/regulation risk – the risk that pending legal and regulatory frameworks prevent the development of use cases – as described below (Exhibit 8).

¹⁵ Cambridge Centre for Alternative Finance

¹⁶ Bitcoin Mining Council

¹⁷ Chainalysis, Elliptic

Exhibit 8: Risks for digital assets and applications

Key risks that could slow the adoption of blockchain technology

Technology	Technology/Adoption Risk	Legal/Regulation Risk
Cryptocurrencies/Tokens	<p>Energy consumption Risk of potential adopters avoiding coins/tokens because of their perceived environmental impact</p> <p>Too big, too fast Risk that grand ideas to transform or remake industries don't pan out, causing potential adopters to cast doubt on the digital asset ecosystem</p>	<p>Environmental risk Risk of regulatory action to reduce the environmental impact of PoW mining</p> <p>Regulatory risk Risk of the SEC implementing onerous regulations or preventing the formation of crypto ETFs</p> <p>Governmental risk Risk of countries banning crypto trading (China and India already have in some capacity)</p>
Non-Fungible Tokens (NFTs)	<p>Awareness Risk that investors may have limited understanding of what they're purchasing or may be buying into the hype phase, causing current and potential adopters to avoid in the future</p> <p>Underlying tech Risk that software bugs cause smart contracts to fail, leading to lack of confidence in the underlying technology</p>	<p>Legal risk NFTs and legal frameworks that involve assets other than images, such as physical assets or the IP for digital art/collectibles, are still developing</p>
Decentralized Finance (DeFi)	<p>Consumer protection Risk that hacks, fraud and rug pulls (developers abandoning failing projects) involving current adopters with limited recourse will cause both current and potential adopters to revert to traditional financial institutions</p>	<p>Regulatory risk Risk of greater disclosure, anti-money-laundering/know your customer (AML/KYC) and reserve requirements creating headwinds for DeFi companies or forcing an industry intended to be decentralized into a more centralized form</p>
Stablecoins	<p>Disclosure Risk that limited disclosure requirements about reserves could lead current and potential adopters of stablecoins to avoid them</p> <p>Too big to fail Risk that stablecoins pegged to fiat currencies could fail, creating a liquidity shock and leading current and potential adopters to cast doubt on the stability of the digital asset ecosystem</p>	<p>Regulatory risk Risk of impending regulations requiring 1:1 currency reserves, reducing the usefulness of stablecoins, or imposing a ban due to the perceived risk of losing monetary policy control</p>
Central Bank Digital Currencies (CBDCs)	<p>Privacy Risk that potential adopters perceive the loss of privacy as a reason to avoid</p> <p>Underlying tech Risk that underlying blockchain technology will not scale effectively</p>	<p>Regulatory risk Risks that issuance is delayed due to concerns around AML/KYC, that benefits of a smoother payments system could be offset by creating competition with bank deposits, or that financial stability could decrease given the potential for bank runs</p>

Source: BofA Global Research

Contributors and Acknowledgments

Key Contributors:

Alkesh Shah

Head of Global Crypto & Digital Assets Strategy

Andrew Moss

Vice President, Global Crypto & Digital Assets Strategy

Disclosures

These materials have been prepared by the Bank of America Institute and are provided to you for general information purposes only. The Bank of America Institute is a think tank dedicated to uncovering powerful insights that move business and society forward. Drawing on data and resources from across the bank and the world, the Institute delivers important, original perspectives on the economy, Environmental, Social and Governance (ESG) and global transformation. Unless otherwise specifically stated, any views or opinions expressed herein are solely those of the Bank of America Institute and any individual authors listed, and are not the product of the BofA Global Research department or any other department of Bank of America Corporation or its affiliates and/or subsidiaries (collectively Bank of America). The views in these materials may differ from the views and opinions expressed by the BofA Global Research department or other departments or divisions of Bank of America. Information has been obtained from sources believed to be reliable, but Bank of America does not warrant its completeness or accuracy. Views and estimates constitute our judgment as of the date of these materials and are subject to change without notice. The views expressed herein should not be construed as individual investment advice for any particular client and are not intended as recommendations of particular securities, financial instruments, strategies or banking services for a particular client. This material does not constitute an offer or an invitation by or on behalf of Bank of America to any person to buy or sell any security or financial instrument or engage in any banking service. Nothing in these materials constitutes investment, legal, accounting or tax advice.

Copyright 2022 Bank of America Corporation. All rights reserved.