



BITCOIN

At the Tipping Point

Citi GPS: Global Perspectives & Solutions

March 2021



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Sandy Kaul

Global Head of Citi Business Advisory Services

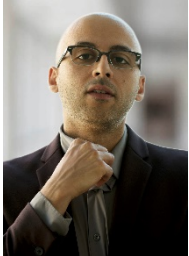
+1-212-723-5118 | sandy.kaul@citi.com



Jonathan Klein

Associate, Citi Business Advisory Services

+1-212-723-2622 | jonathan.klein@citi.com



Omid Malekan

Blockchain Innovation Expert
Citi Ventures
Adjunct Professor, Columbia Business School

omid.malekan@citi.com



Richard Webley

Head of Citi Global Data Insights

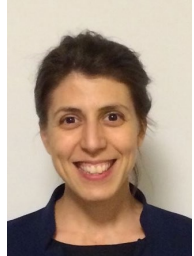
+1-212-723-4576 | richard.webley@citi.com



Shobhit Maini

Markets & Securities Services Transformation

+44-20-7508-7470 | shobhit.maini@citi.com



Ioana Niculcea

FinTech & Emerging Technology Lead,
Citi Business Advisory Services

+1-212-723-5075 | ioana.niculcea@citi.com

BITCOIN

At the Tipping Point

Kathleen Boyle, CFA
Managing Editor, Citi GPS

The first Citi GPS venture into digital currency was back in 2014 when we featured it in an article in our second [Disruptive Innovations](#) report. Although we discussed Bitcoin, we did so with the caveat that it was a branded digital currency and a freely available generic Bitcoin technology but there was the potential that a non-Bitcoin alternative digital currency would one day supplant it. In May 2014, when we published the report, Bitcoin was just five years old with a market value around \$6.2 billion. We wrote that Bitcoin was familiar and welcome to younger generations and although older investors may have heard the word, they were generally less familiar with it and more skeptical. We recognized there was very little Bitcoin activity among institutional investors in organized financial markets as it was considered 'far too risky and volatile'. In the end, we still assessed Bitcoin as a 'wannabe asset' and a 'wannabe means of transaction' and lamented that although you could have a lot of Bitcoin, but there wasn't much to do with it.

Another thing we've learned while writing Citi GPS reports on disruptive innovations is the time it takes a new product to become widely used by global customers has decreased dramatically. According to Visual Capitalist, it took the telephone 50 years to reach 50 million customers, 22 years for television, seven years for the Internet and just 19 days for Pokémon Go. So it's not a surprise the uptake of Bitcoin in the past almost 7 years has been nothing but extraordinary. Not only has Bitcoin increased in usage and value (hitting \$1 trillion in market capitalization in February 2021), but it has created a whole ecosystem around it — including crypto exchanges, crypto banks, and new offerings into savings, lending, and borrowing.

In the report that follows, the authors note the biggest change with Bitcoin is the shift from it being primarily a retail-focused endeavor to something that looks attractive for institutional investors. In a search for yield and alternative assets, investors are drawn to Bitcoin's inflation hedging properties and it is recognized as a source of 'digital gold' due to its finite supply. Specific enhancements to exchanges, trading, data, and custody services are increasing and being revamped to accommodate the requirements of institutional investors.

Bitcoin is also evolving as the 'North Star' in the digital asset space and is a compass for the evolution of a broader ecosystem of crypto commerce. New innovations, including the announcement of fiat-backed stablecoins, used within public and private networks, may build pressure for central banks to consider their own digital currency options.

Where could Bitcoin be in another seven or so years? The report notes the advantage of Bitcoin in global payments, including its decentralized design, lack of foreign exchange exposure, fast (and potentially cheaper) money movements, secure payment channels, and traceability. These attributes combined with Bitcoin's global reach and neutrality could spur it to become the currency of choice for international trade.

There are a host of risks and obstacles that stand in the way of Bitcoin progress. But weighing these potential hurdles against the opportunities leads to the conclusion that Bitcoin is at a tipping point and we could be at the start of massive transformation of cryptocurrency into the mainstream.

MAINSTREAM ACCEPTANCE OR SPECULATIVE IMPLOSION?

BITCOIN SHOWING GROWING LEVELS OF ADOPTION

Bitcoin initially drew interest from owners for its underlying technology and social value proposition plus its financial potential. As it has matured, attention has shifted to the business case around Bitcoin, its expanding utilization, and the growing commerce ecosystem around cryptocurrencies.



36%

of small-medium business in the U.S. accepting Bitcoin in 2020

Source: HSB



\$536 million. +55%

Bitcoin monthly trading volumes in South Africa and Nigeria in August 2020

Source: Reuters



\$20 billion per day

Bitcoin OTC trading volumes in early 2020

Source: Hacker Noon



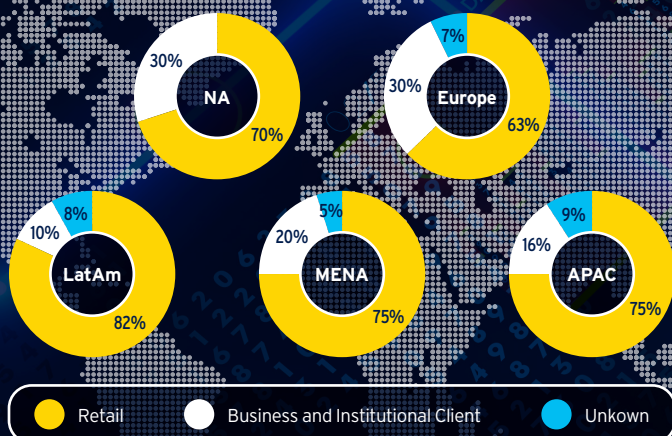
\$500 billion

Crypto exchange volumes in the first three weeks of 2021, twice the volumes of 2017-2018

Source: Coindesk

Ownership of Bitcoin is primarily retail, but institutions are increasingly interested

Source: Blandin et al 2020



INSTITUTIONAL INTEREST IN BITCOIN ACCELERATES

The intersection of low yields and inflationary expectations has increasingly fostered the institutional investor view that Bitcoin could represent an inflation hedge, a portfolio diversifier, and a safe haven not currently offered by traditional government bonds all at once.

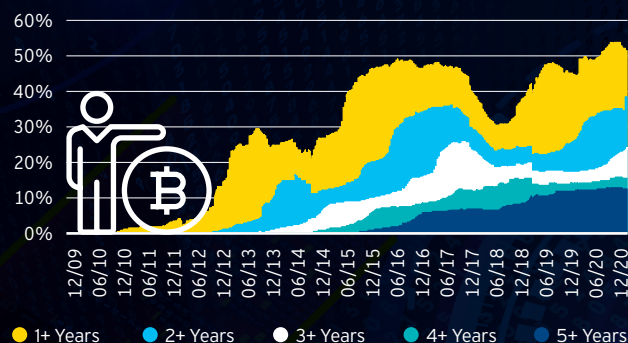
Indications of increased institutional activity in Bitcoin include:

Open interest in CMEs Bitcoin futures, a benchmark for institutional activity, surged by over 250% between October 2020 and January 2021.

The holding period for Bitcoin has increased, with 10% of Bitcoin now being held for five years or longer

Source: Coin Metrics

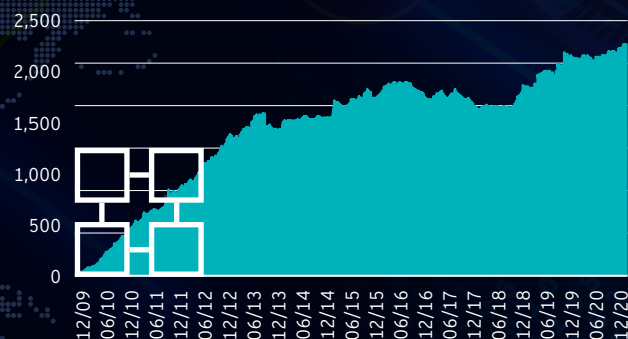
Percent of Bitcoin Supply Held Over Time



The number of blockchain addresses holding 1,000+ Bitcoins has increased steadily

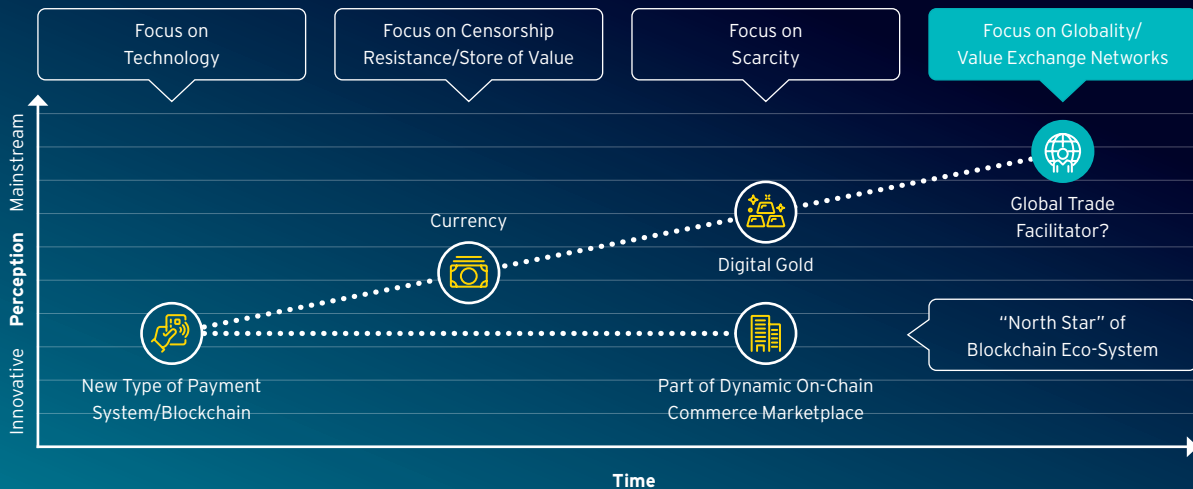
Source: Coin Metrics

Addresses



MAPPING THE FUTURE FOR BITCOIN

Perceptions about what makes Bitcoin important continue to evolve and create new opportunities while increasing its perception towards becoming mainstream. A focus on global reach and neutrality could see Bitcoin become an international trade currency. This would take advantage of Bitcoin's decentralized and borderless design, its lack of foreign exchange exposure, its speed and cost advantage in moving money, the security of its payments, and its traceability.



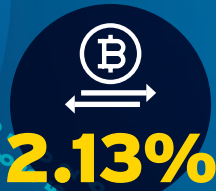
OBSTACLES REMAIN

The entrance of institutional investors has sparked confidence in cryptocurrency but there are still persistent issues that could limit widespread adoption. For institutional investors, these include concerns over capital efficiency, insurance and custody, security, and ESG considerations from Bitcoin mining. Security issues with cryptocurrency do occur, but when compared to traditional payments, it performs better.

Illicit Activity



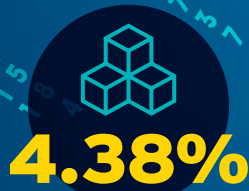
As a % of total cryptocurrency transfer value (2020)



As a % of total cryptocurrency transfer value (2019)



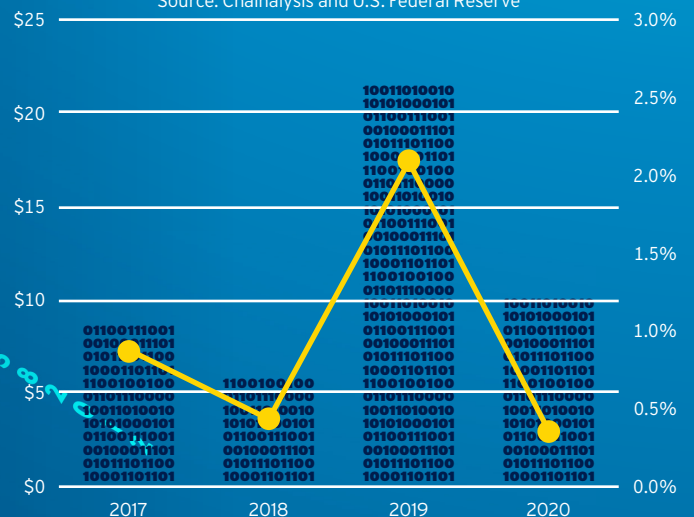
As a % of aggregate credit and debit card network (2016)



As % of transactions in depository institutions (2016)

Total Illicit Value

Source: Chainalysis and U.S. Federal Reserve



Total Illicit Value - USD Billions (LHS)

Share of Total Cryptocurrency Transfer Value (RHS)

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Introduction

For an innovative asset just over a decade old, Bitcoin has already amassed a fairly storied history. There is the mystery of its founder, the anti-establishment creed of the cypherpunk movement that spawned it, lingering suspicions that it is used in illicit activities, the multi-million dollar pizza transaction, and its notorious volatility with not just one, but three distinct speculative bull runs, two of which resulted in equally dramatic collapses and the third of which is currently underway.¹

Large swaths of the traditional banking and financial markets view Bitcoin as a completely valueless asset. Nouriel Roubini, a professor at New York University's Stern School of Business, recently called it a “*self-fulfilling bubble*” and claimed that the stone age cartoon family, the “Flintstones had a better monetary system.”

And yet...

The novelty of the blockchain technology underpinning the Bitcoin payment system network has been hailed as a breakthrough and a growing ecosystem of applications and use cases are emerging to validate its importance and utility.

- The use of Bitcoin as a censorship-resistant store of value is facilitating its expanding use as a currency: PayPal, Visa and Mastercard are now accepting it across their vast merchant networks; brand name companies such as Microstrategy and Tesla are moving parts of their corporate treasuries into Bitcoin; charities like the American Cancer Society are accepting Bitcoin donations; there were nearly 12,000 Bitcoin ATMs deployed by the end of 2020; a new Visa credit card allows users to earn Bitcoin as rewards; and more companies are beginning to accept Bitcoin payments, including one that lets you pay for your next space voyage in Bitcoin.
- Bitcoin's engineered approach to ensuring digital scarcity is also prompting many experienced investors to compare it to digital gold. Source code in the Bitcoin network only allows for the creation of 21 million Bitcoins, of which 18.6 million are already in circulation. The complexity of mining Bitcoin becomes increasingly difficult as more supply emerges based on its algorithmically-designed approach that adjusts down the rate of production as more coins enter circulation, which helps to insulate it from inflation. Given today's macro investing environment, many investors are looking to hold Bitcoin positions as a hedge given fiscal and monetary Covid-19-related policy impacts.

These evolving views of Bitcoin are being facilitated by an ecosystem that is becoming increasingly professionalized. Bitcoin holders can earn interest on their balances, loan their coins, and even borrow against them. Cryptocurrency exchanges that were vulnerable to technology disruptions and liquidity concerns in the 2017 rally have become far more secure, can stream their prices via application programming interfaces (APIs), have introduced a broad set of risk and analytic tools, and offer specialized algorithms to improve execution. Over-the-counter (OTC) trading desks are facilitating larger order sizes and derivatives are gaining open interest.

¹ “Dr. Doom Economist Nouriel Roubini says ‘The Flintstones had a Better Monetary System than Bitcoin’ and the Token Should Not Be Considered a Currency,” Will Daniel, February 17, 2021, [Business Insider](#).

Prime brokerage offerings are providing best execution services and margin financing, while third-party custody solutions are creating viable options for safekeeping and are obtaining insurance to protect against loss and theft of assets. Regulators are starting to offer guidance, and in some jurisdictions, register and license cryptocurrency participants.

Moreover, while many in the traditional world view Bitcoin as revolutionary, there is a growing set of businesses emerging on blockchain-based platforms looking to create innovations that far surpass Bitcoin's original goals. Decentralized applications (DApps) are being created and are experimenting with new approaches to governance, asset creation, peer-to-peer transactions, and algorithmically-designed servicing. The decentralized finance (DeFi) space is surging, with total value locked in these DApps increasing 20x — from \$1.0 billion in January 2020 to \$10.0 billion by year-end.² To these businesses, Bitcoin is the 'North Star' that points the way and its success is seen as a barometer of interest in the overall on-chain ecosystem.

Moving money between the traditional fiat currency-based economy and this emerging on-chain landscape has been difficult, relying on traditional payment rails and networks that often place limits on the extent of user activity. Stablecoins are a newer offering providing a more efficient mechanism that acts as on and off ramps between the two domains.

Fiat currency stablecoins are collateralized vehicles that can be used to move large sums of money from the off-chain into the on-chain ecosystem and allow those coins to circulate like any other cryptocurrency within blockchain-based ledgers and digital wallets. These coins are effective for use within public network blockchains, but they also provide a template for private networks.

Diem, formerly the Facebook Libra initiative, is creating a private stablecoin for use within their members-only network comprised of brand name firms such as Uber, Lyft, Spotify, and Facebook. Other private networks are also emerging. These developments increase the potential of a growing share of daily transaction activity beginning to occur in private coins that lie outside government control. As such, pressure is growing for governments to issue their own digital currencies. A January 2021 study of 60 central banks by the Bank of International Settlements found that 86% indicated they were engaged in some work on Central Bank Digital Currencies (CBDCs) and 60% were either running experiments or proofs of concept.³

If these efforts progress to the actual issuance of central bank-backed digital currency, blockchain would become a mainstream offering. Individuals and businesses would have digital wallets holding a variety of cryptocurrencies, stablecoins, and CBDCs just like they today have checking, savings, and treasury accounts. Connectivity between the traditional fiat currency economy, public cryptocurrency networks, and private stablecoin communities would become fully enabled.

² "What's in store for DeFi in 2021? The Analysis and Predictions", BTC Peers, January 18, 2021, [Yahoo Finance](#)

³ *Ready, Steady, Go? Results of the Third BIS Survey on Central Bank Digital Currency*, [BIS Papers No. 114](#).

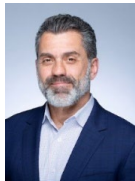
In this scenario, Bitcoin may be optimally positioned to become the preferred currency for global trade. It is immune from both fiscal and monetary policy, avoids the need for cross-border foreign exchange (FX) transactions, enables near instantaneous payments, and eliminates concerns about defaults or cancellations as the coins must be in the payer's wallet before the transaction is initiated.

Obstacles and challenges still exist and while the path we describe for Bitcoin is possible, it is by no means assured. Upgrades in the way the marketplace works would be required before broad institutional participation could be envisioned. Such enhancements would move Bitcoin and the cryptocurrency space closer to the oversight and rules of traditional financial regulators. This in turn may cause many of the most innovative developers and entrepreneurs to exit the ecosystem, as it moves away from the anti-establishment ethos of Bitcoin's roots. Finally, the macro investing environment may shift and make the need for a new asset with Bitcoin's profile less pressing.

Bitcoin's future is thus still uncertain, but developments in the near term are likely to prove decisive as the currency balances at the tipping point of mainstream acceptance or a speculative implosion.

Acknowledgement

In preparing to write this report, we completed a series interviews with CEO's and professionals of some of the leading custodians, prime brokers, exchanges, infrastructure, and asset management companies, in addition to select experts within Citi. We thank them for all of their sharing their knowledge and expertise.



Nick Carmi
CEO, BitGo Prime



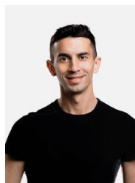
Jonathan Levin
Co-Founder & Chief Strategy Officer



Tony McLaughlin
Emerging Payments & Business Development,
Treasury & Trade Solutions



Itay Tuchman
Global Head of FX, MSS



Itay Malingher
Co-Founder & CEO



James Stickland
CEO



Juri Bulovic
Director, Bitcoin Mining



Zac Prince
Founder & CEO



Morgan McKenney
COO of Global Consumer Bank



Puneet Singhvi
Head of DLT and Digital Assets, MSS



Tim Rice
Co-Founder & CEO



Bin Ren
Board Member



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CEO





Michael Shaulov
Co-Founder & CEO



Rochelle Guillou
Market Analyst



Michael Moro
CEO



Rune Christensen
CEO



Wayne Trench
CEO



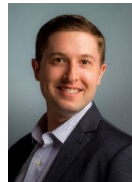
Marcos Viriato
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Dave Balter
CEO



Eric Stone
Head of Data Science



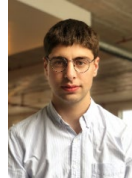
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CEO



Matt Long
Head of Distribution & Prime



Cristián Bohn
Co-Founder, CFO & CPO



Matteo Leibowitz
Strategy Lead



Section 1

Bitcoin Origins: Launch of a New Payment System

In August 2008, the domain name bitcoin.org was registered online. Two months later, a paper entitled “*Bitcoin: A Peer-to-Peer Electronic Cash System*” emerged from an author named Satoshi Nakamoto.⁴ For a document that launched a financial revolution, the Bitcoin white paper is surprisingly sparse.⁵ It is only nine pages long and focused primarily on the technical specifications of the proposed network: a distributed transaction record made immutable with cryptography, pseudonymous access enabled by cryptographic keys, and a transaction verification process known as proof of work. The words blockchain, cryptocurrency, and mining do not appear in it.

We still do not know the identity of the individual or group who wrote that paper and subsequently helped to design and establish the network, despite the fame and riches that could come from launching a trillion-dollar industry.⁶ We can only speculate about their motivation, but their early writings reveal something far less ambitious than what Bitcoin has turned out to be.

Original Goals of the Network

Despite the popular belief within crypto circles that Satoshi Nakamoto was some kind of a monetary prophet out to dethrone fiat currency, a closer read reveals them to be more of a technical expert trying to design a new type of payment system. The word currency only appears once in the white paper, and only in reference to physical cash. Looking at Figure 1 you can see what Satoshi’s intentions were in the original whitepaper.

Figure 1. Satoshi Nakamoto's Whitepaper

I've been working on a new electronic cash system that's fully peer-to-peer, with no trusted third party.

The paper is available at:
<http://www.bitcoin.org/bitcoin.pdf>

The main properties:
Double-spending is prevented with a peer-to-peer network.
No mint or other trusted parties. *
Participants can be anonymous.
New coins are made from Hashcash style proof-of-work.
The proof-of-work for new coin generation also powers the network to prevent double-spending.

Source: Satoshi Nakamoto Institute

⁴ “Everything You Need to Know About Bitcoin”, Zoe Bernard, [Business Insider](#), November 10, 2018.

⁵ “Bitcoin: A Peer-to-Peer Electronic Cash System”, Satoshi Nakamoto, [Bitcoin.org](#), October 31, 2008.

⁶ Total crypto market capitalization data from Coin Metrics.

Nakamoto published the paper in a mailing list dedicated to the cypherpunk movement — a loosely affiliated group of individuals who believed that cryptography should be used to preserve sovereignty and privacy on the Internet.⁷ He was not the first person to attempt to invent a peer-to-peer payment solution, and most of the technical components of his creation were invented by others (as cited in the paper). But he succeeded where others had failed because of his novel solution to the problem of digital scarcity.

This concept of digital scarcity is critical. At its core, digital scarcity means being able to control both the amount of a certain good and how it is exchanged in the online world.⁸ A new type of payment network might be devised to control how money is exchanged, but how do you control the amount of money that moves through that network to ensure it is not being copied and double-spent?

Money, as we understood it before Bitcoin, existed in two forms: either as a physical object that's hard to produce and replicate (e.g., gold coin or dollar bill) or a ledger entry preserved by an authority, like a corporation or government.

Electronic payments had already been around for over 130 years, arguably dating back to when Western Union launched a telegram-based payment service.⁹ But that payment system, along with every other one invented since, required a powerful intermediary who played the role of a trust bearer to update the ledger and preserve the integrity of the money contained in it. Venmo users can only send the same dollar once, for the simple reason that Venmo will not let them double-spend that money, and might kick out those who try.

Bitcoin sought to build an electronic payment system operating without such an intermediary, but one that would still preserve integrity by preventing double spending. Before Bitcoin, similar attempts at building decentralized payments had stumbled on the issue of digital scarcity: if nobody is in charge, how do you prevent users from cheating?

Nakamoto's main contribution was the use of financial rewards to incentivize honest behavior. Unlike a traditional payment system, where a known, central entity validates all transactions, Bitcoin incentivizes pseudonymous users to validate transactions. One fundamentally important fact is that Bitcoin pays user in the native currency of the network. Paying that reward is the final step in a complicated chain of events unfolding every ten minutes, on average.

The potential of a distributed system where different nodes come to a consensus on the likeliest version of reality dates back to the space program, and was mathematically solved 40 years ago.¹⁰ If the Bitcoin network was operated by a group of known governments or corporations, they could just vote on which transactions were valid. There would be no need for all of the cryptographic complexity and electricity usage.

⁷ "Cypherpunk", [Wikipedia](#).

⁸ "What is Digital Scarcity? How is it Useful?", Nikhill Rajesh, [Simple Snippets](#), July 12, 2018.

⁹ "6 fascinating things about Western Union's history", Cecilia Hendrix, [Western Union](#), October 8, 2019.

¹⁰ "The Byzantine Generals Problem", Leslie Lamport, Robert Shostak, and Marshall Pease, [SRI International](#), July 1982.

But Nakamoto was more ambitious and wanted to let anyone participate in consensus, and to do so anonymously. Voting was no longer an option because one participant could now pretend to be many and stuff the ballot, like an unscientific online poll where anyone can vote as often as they like. To maintain integrity, the Bitcoin protocol asks for volunteers known as *miners* to vet transactions on everyone else's behalf. Those who would like to try, have to prove honest intent by spending resources.

Every Bitcoin transaction is sent to a transparent queue to await approval. Would-be miners process the latest transactions — looking at the ledger data to make sure (1) the money being sent is actually there, (2) it is being sent by the rightful owner, and (3) it is not being double-spent. The would-be miner then packages the transactions they have reviewed into a cryptographically-secured data package known as a block. Each block is mathematically linked to the most recent one, forming a chain.

But before broadcasting the latest block to everyone else, miners have to solve a cryptographic problem, one that forces them to use a lot of electricity. Bitcoin mining is highly competitive. The miner who solves the problem first gets to share their findings with the rest of the network, where it's double checked by everyone else. If the work was honest, that winning miner gets paid a combination of transaction fees and newly minted coins.¹¹

Miners have a vested interest keeping Bitcoin valuable as they spend their local currency (USD, RMB, etc.) to compete but earn Bitcoins as their reward. The best way to do that is by *not* cheating the system. There are many ways to successfully attack this process. It just so happens that doing an honest job is more profitable.

Digital scarcity has therefore been secured in two ways. Miners are motivated to prevent double spending, and paid via algorithmically-controlled rewards. In its source code, Bitcoin stipulates there will only ever be 21 million coins created. The vast majority have already been minted.¹²

The amount of new Bitcoin released with each mined block is called the "block reward". The size of this reward is halved every time 210,000 blocks are added to the blockchain, approximately every 4 years. In Bitcoin's early days, the winning miner would receive 50 Bitcoins. In 2012 the figure was halved to 25 Bitcoins and was again cut in 2016 to 12.5 Bitcoins. In May 2020, the block reward was cut to 6.25 Bitcoins.¹³ This approach not only helps to protect the value of Bitcoin from inflationary pressures, but it also reinforces the concept of digital scarcity.

Sending a Bitcoin transaction also requires payment of a transaction fee denominated in its native asset to the miners. Expectations are that when the full 21 million Bitcoin are in circulation, the transaction fee alone should become incentive enough to sustain the system because the volume of transactions should be significant, and the price of the coin high.¹⁴

¹¹ "Mastering Bitcoin", Andreas M. Antonopoulos, O'Reilly Media, June 8, 2017.

¹² "What Happens to Bitcoin After All 21 Million are Mined?", Adam Hayes, [Investopedia](#), December 17, 2020.

¹³ Ibid.

¹⁴ Ibid.

The technical and monetary nature of Bitcoin's design mean the network could not survive without the native asset, and vice versa. Today, most people think of blockchain as a decentralized network technology enabling a new kind of currency. While true, it's also possible to assert that the currency was actually invented to enable the network.

“ I think Bitcoin is the next stop on the evolution of money and value. Society dictates what money is and we've evolved from rocks, salt, gold, paper money, to digital money — which is where money is going.

– MICHAEL SONNENSHEIN, GREYSCALE

”

“ Bitcoin is an educator. Bitcoin challenges our existing understanding of what money is and what it could be. A lot of people go through this journey thinking Bitcoin is not a legitimate asset or that it will never work for a number of reasons, but as they study it more and more, they eventually come to realize there's something interesting there.

– JURI BULOVIC, FIDELITY CENTER FOR APPLIED TECHNOLOGY

”

“ Bitcoin is like the first plane built by the Wright Brothers. They built it using human intuition and imitation of birds, long before fluid dynamics were formulated. Bitcoin was built by Satoshi using intuition and heuristics, and he didn't start with a theoretical framework as the foundation.

– BIN REN, ELWOOD ASSET MANAGEMENT

”

“ A few years ago people wondered if crypto would cease to exist, but that existence question is no longer valid. The longer something stays in existence the less likely it's a fad. If it is not going away, everyone needs to figure out how to interact with it.

– PUNEED SINGHVI, HEAD OF DLT AND DIGITAL ASSETS, CITI MARKETS & SECURITY SERVICES

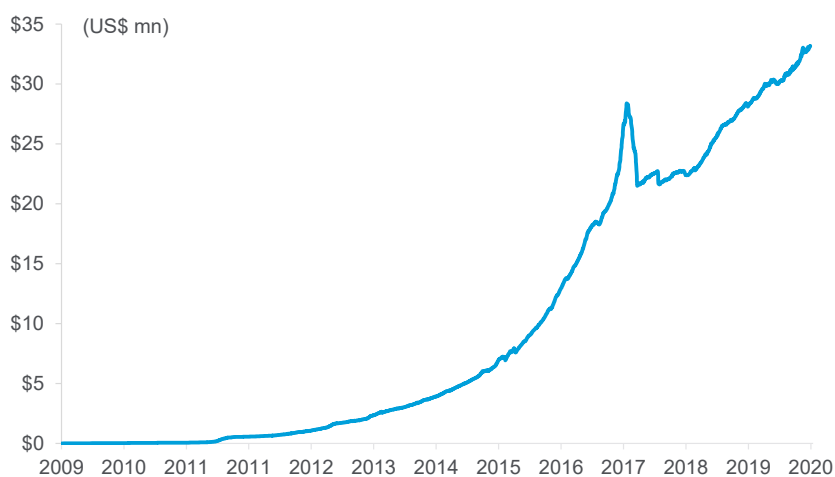
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A New Kind of Payment System; A Different Kind of Currency

Regardless of intent, both Bitcoin and blockchain have spawned a financial revolution by being radically different from anything before them. The Bitcoin network is the first truly global payment system. It knows no borders, never closes, is not owned by anyone, and is accessible to everyone. Unlike traditional payment systems that exist on private servers, the Bitcoin blockchain is distributed across thousands of machines all over the world. Anyone can maintain their own copy of the shared ledger.

We do not know how many users — people and companies who send or receive transactions — the network has, because everyone is pseudonymous, and one user can have many different addresses (blockchain terminology for an account with a balance). What we do know is that there were over 33 million of such addresses as shown in Figure 2.¹⁵

Figure 2. Growth in Bitcoin Addresses with a Balance



Source: Coin Metrics, Citi Business Advisory Services

Part of Bitcoin's appeal is its censorship resistance: the idea that nobody can be denied access for any reason. This feature makes the Bitcoin payment network the most universally accessible one on earth — for better and for worse.

Traditional payment systems such as e-money, credit card rails, or automated clearing houses (ACH) are built on the commercial banking system and are only available to people who can pass the financial industry's stringent Know Your Client (KYC) requirements. Such systems lock out significant portions of the global population, particularly in developing countries. This lack of financial inclusion is increasingly seen as a social problem, especially now that digitization is diminishing the role of cash everywhere. The lack of financial inclusion is highlighted in Figure 3, which comes from a World Bank study that found there were over 1.7 billion unbanked adults in 2017.¹⁶

¹⁵ Citi Business Advisory Services' analysis based on Coin Metrics data

¹⁶ "The Global Findex Database", Asli Demirguc-Kunt and Leora Klapper, [World Bank Group](#), 2018.

Figure 3. Globally, 1.7 Billion Adults are Unbanked (Adults without an account, 2017)



Note: Data are not displayed for economies where the share of adults without an account are 5 percent or less.
Source: Global Findex database

The Bitcoin payment system is uniquely resilient. Distribution makes it difficult for any one corporation or government to interfere with its operation, and censorship resistance makes it practically impossible to lock out any one group of people. The network is also uniquely accurate.

Put together, all of these properties make the Bitcoin network a true offspring of the digital era. There is no scheduled down time, no 'opens' or 'closes', and no painstaking reconciliation. A transaction across the globe happens as seamlessly as one across the room, for the simple reason that as far as the blockchain is concerned, each is just a ledger entry: a debit and a credit.

Also noteworthy is the network's radical transparency. Individual users might be anonymous, but their activities are not, as every single coin comes with its own verifiable audit trail.¹⁷ Despite its reputation as a tool of the underworld, the transparency of the Bitcoin ledger is in some ways a better friend to law enforcement than traditional approaches, where payments data has to be extracted from different siloed organizations and pieced together.

The Bitcoin ledger has already been used to quickly solve large-scale crimes and identify criminal activity — one explanation as to why illicit activity is currently believed to make up less than 1% of transaction activity, a stark contrast to the 2% to 5% of global GDP caught up in money laundering alone.¹⁸¹⁹²⁰

¹⁷ "The Truth About Blockchain", Marco Iansiti, and Karim R. Lakhani, [Harvard Business Review](#), January 2017.

¹⁸ "How a Bitcoin Trail Led to a Massive Dark Web Child-Porn Site Takedown", Lily Hay Newman, [Wired](#), October 16, 2019.

¹⁹ Daily Highlights, [Chainalysis](#).

²⁰ "Money Laundering", [United Nations](#).

First Decade Marked by Speculation & Pushback

Early adopters of the Bitcoin experiment fell into two camps — ethos-oriented tech developers and miners and early traders — whose divergent views about its potential still influence the current debate around Bitcoin's future.

One set of participants were drawn by the novelty of the underlying technology and the uniqueness of the social value proposition. That proposition took on a brand-new meaning during the 2008 financial crisis, where government bailouts of traditional payment providers, often funded with printed money, increased the appeal of a decentralized payment system enabled by a deflationary currency. Evidence suggests that the creator(s) of Bitcoin emerged from this camp.

The forum where the Bitcoin whitepaper was originally released was comprised of a community of developers that saw cryptography-enabled identity as a pathway to eliminating government control over an individual's personal and economic life. The Bitcoin genesis block — the first batch of transactions to be written into the ledger — famously includes a newspaper headline about the 2008 bank bailouts, suggesting that the creator(s) of Bitcoin shared this view.²¹

This libertarian ideal had broad appeal and lent a certain anti-establishment creed to Bitcoin that drew many in the technology field. It also proved to be a draw to many digital-savvy Millennials. Even today, many will speak of the “ethos” of the Bitcoin community which refers to the idealized potential of what the network might enable.

Still, other early adopters saw the financial potential in the Bitcoin experiment. Online forums where individuals shared views on Bitcoin started to move offline in the early 2010s as meet-ups began in San Francisco and elsewhere, bringing early proponents together. Many attendees at those forums were avid traders, looking to buy and sell Bitcoin as a speculative pursuit, riding the early highs and lows in perceived value of the coin, and treating it like an asset based on its digital scarcity.

The difficulties these early traders encountered when trying to convert their dollars to Bitcoin and back again prompted some in this group to go on and form Bitcoin exchanges where the currency could be exchanged for the U.S. dollar. Even then, these participants had a difficult time getting banks to open accounts for their fiat currency dollar holdings, prompting continued innovation, which we discuss in more detail in Section II.

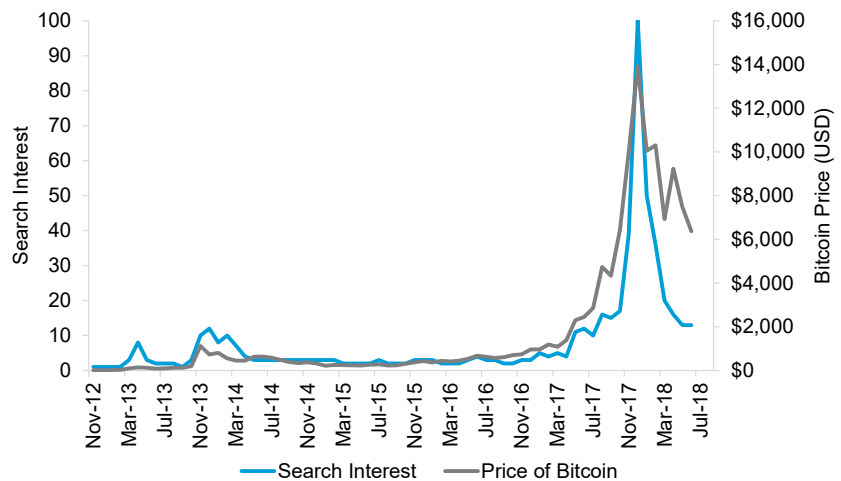
The combination of an anti-establishment appeal and a new set of trading exchanges that enabled wide access to Bitcoin helped spark a speculative bull run by the mid-2010s.

One pattern illustrating how individuals were learning about and jumping into Bitcoin is presented in Figure 4. It shows how Google searches for Bitcoin correlate closely with the price changes in Bitcoin. Though hard to see given the height of its later move, this phenomenon was first evident in the 2013-2014 run-up, which was partially driven by the banking crisis and “bail-ins” in Cyprus.²²

²¹ Ibid.

²² “Bitcoin prices surge post-Cyprus bailout”, Maureen Farrell, [CNN](#), March 28, 2013.

Figure 4. Monthly End Price of Bitcoin vs. Google Search Queries for Bitcoin



Source: Coin Metrics, Citi Business Advisory Services

Bitcoin's two communities often find common cause whenever there's a problem within (or restriction forced upon) the traditional banking system. The bull market in 2013-14 ended with a high profile hacking and theft of the then biggest exchange — one that undermined confidence in the market.²³ Evolution of the ecosystem and growing adoption helped spur a second, far larger rally in 2016-2018.

Bitcoin's growing coverage in the press, especially during the 2016-2018 run up, helped bring attention to the innovation represented by the underlying technology, but it also led to two reputational concerns that continue to exist today:

- **Bitcoin's Use for Criminal Enterprise:** Authorities took down an illegal online drug marketplace called Silk Road in October 2013. Its founder was charged with engaging in a money laundering and narcotics trafficking conspiracy as well as computer hacking. The U.S. Department of Justice seized Silk Road's website as well as somewhere between \$3.5 and \$4 million in Bitcoin used to buy drugs on the site.²⁴ This incident left a lingering perception for Bitcoin as being associated with criminal enterprises, despite the fact that in 2020 less than 0.5% of transactions were deemed as being utilized in illicit activities.²⁵
- **Bitcoin's Potential to Disrupt Financial Services:** Optimistic and sometimes hyperbolic pronouncements about the potential of Bitcoin to disrupt traditional payment rails, banking, and even government control of currency has prompted skepticism and pushback. Famously, in late 2017, Jamie Dimon, Chairman and CEO of JPMorgan Chase, called Bitcoin a "fraud" with his statement at the Institute of International Finance Conference that people who are "stupid enough to buy it" will pay the price for it in the future.²⁶

²³ "The Largest Cryptocurrency Hacks So Far", Nathan Reiff, [Investopedia](#), June 25, 2019.

²⁴ "End of the Silk Road: FBI Says it Busted the Web's Biggest Anonymous Drugs Black Market", Andy Greenberg, [Forbes](#), October 2, 2013.

²⁵ Data from Coindesk.

²⁶ "Jamie Dimon says if you're 'stupid' enough to buy bitcoin, you'll pay the price one day", Evelyn Cheng and Kayla Tausche, [CNBC](#), October 13, 2017.

He tempered these remarks just a few months later, remarking that he regretted calling Bitcoin a fraud, admitted it was not his “cup of tea”, and worried aloud about “what governments are going to feel about Bitcoin when it gets really big.”²⁷

Some governments did react as Bitcoin rose to ever higher highs in 2017-2018. Several governments currently have an outright ban on Bitcoin including Algeria, Ecuador, Egypt, Nepal, and Pakistan. Others, including Saudi Arabia and Taiwan, have introduced a partial ban, typically blocking financial institutions from dealing in the cryptocurrency or facilitating Bitcoin transactions.²⁸

Even in countries without outright bans or restrictions regarding Bitcoin's use, there are often restrictions on the on and off ramps utilized to move fiat currency into the cryptocurrency domain, making it very difficult to obtain and use Bitcoin.²⁹ China, Japan, and South Korea have all announced different measures to better regulate crypto-trading.³⁰

Concurrent with the growing focus, skepticism, and crackdown occurring around Bitcoin, a series of crypto exchange hacks took place that shook investor confidence. The earliest headline grabbing hacks had occurred before widespread attention was focused on Bitcoin. The Mt. Gox hack in 2014 resulted in a loss of approximately \$231 million and in 2016 the DAO—a blockchain organization that was based on Ethereum — lost an amount equivalent to \$50 million, with both figures reflecting the BTC-USD and ETH-USD exchange rates at the time.³¹

Other hacks that occurred as Bitcoin prices were rallying had more of an impact. In January 2018, right as Bitcoin was hitting its peak, the Japanese exchange Coincheck disclosed a hack of a different cryptocurrency equivalent to a record \$487million. Another hack hit the South Korean exchange Coinrail later that year, with a loss of over \$50 million in tokens.³² These news-grabbing events began to shake investor confidence.

Respected voices like Warren Buffet calling Bitcoin “rat poison squared” further undermined interest.³³ Bitcoin tumbled from its peak of \$19,000 in December 2017 to around \$10,000 in February 2018 as speculators withdrew. That downtrend extended into the beginning of 2019, eventually taking the market down to just above \$3,000.

Counterintuitively, all of these events helped build the foundation for the rally starting at the end of 2020, first via messaging. As negative as a headline of a multi-million-dollar hack might sound on the surface, it carries the subtext of digital scarcity. After all, nobody ever worries about a breach of the music on Spotify, because digital music is the opposite of scarce. The fact that Bitcoins can be stolen,

²⁷ “Jamie Dimon says he regrets calling bitcoin a fraud and believes in the technology behind it”, Tae Kim, [CNBC](#), January 9, 2018.

²⁸ “What the Hell Happened to Crypto this Year?”, Cale Guthrie Weissman, [Fast Company](#), December 21, 2018.

²⁹ “Can a Country Actually Ban Bitcoin?”, Daniel Phillips, [Decrypt](#), August 18, 2020.

³⁰ “What the Hell Happened to Crypto this Year?”, Cale Guthrie Weissman, [Fast Company](#), December 21, 2018.

³¹ Ibid.

³² Ibid.

³³ Ibid.

and the theft hurts, but there is no way to get a replacement, only proves the coins are valuable, which in turn proves the technology works.

After the speculative fever of the 2017-18 bubble abated, Bitcoin moved out of the headlines. Without the spotlight, attention began to shift to the growing business case around Bitcoin and how it was expanding its utilization and inspiring a growing commerce ecosystem.

“ If you think about the roles that financial institutions play, blockchain removes their roles as intermediaries. If financial institutions embrace blockchain, they need to rethink their own business model and what value they bring. Otherwise they may become increasingly irrelevant. Fifteen years ago it was said that eCommerce was the future and many retailers didn't believe it. We will be living in a hybrid world of centralized and decentralized systems in the next 5-10 years.

– BIN REN, ELWOOD ASSET MANAGEMENT

”

“ Bitcoin is proof that the way global governments and economic systems have treated money is no longer valid. It is amplifying investor behavior in a way that has never happened previously. It has changed belief systems, and it will be the proof point that our economic infrastructure is more fragile than we have ever known — and a future that is better and more stable is right in front of us.

– DAVE BALTER, FLIPSIDE

”

“

In the developed world, digital currencies in the near term are speculative investments. In the developing world, digital currencies are a springboard to financial inclusion. Look at the advent of cell phones as a technology that leapfrogged traditional landlines. It's similar to digital currencies since half of the world's adult population don't have access to financial services. Digital currencies like Bitcoin could help leapfrog traditional banking systems.

– MICHAEL SONNENSHEIN, GRAYSCALE

”

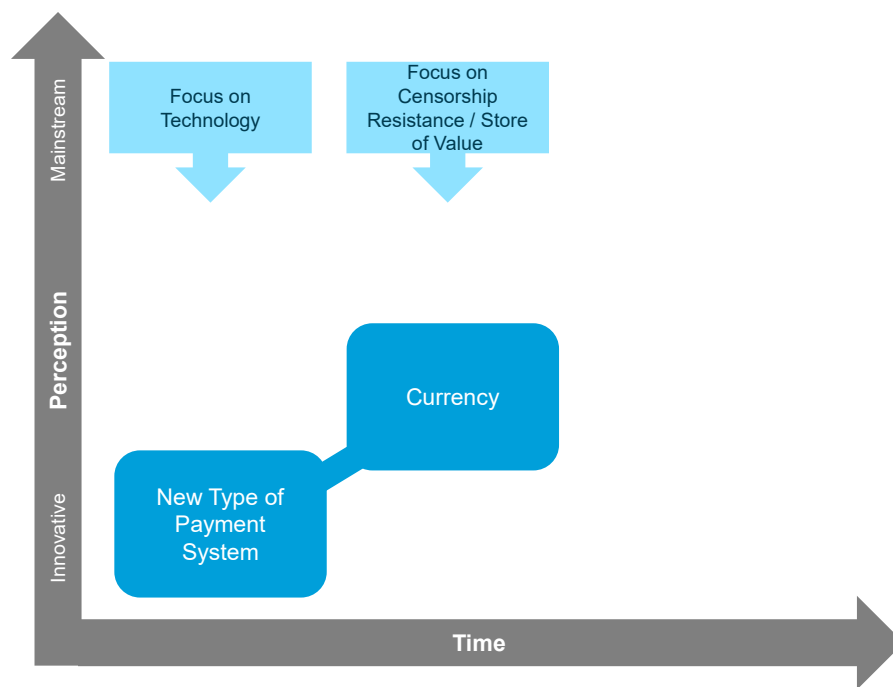
Section II

Maturation of Ecosystem Spurs Fresh Consolidation

The bulk of participation in Bitcoin during its early years of growth focused on either mining to earn revenues or speculation in Bitcoin prices by financial traders. Individuals drawn to the anti-establishment creed, the novel technology and proof of work approach, the excitement of a new marketplace, or simply the 'cool factor' were the force driving early activity. What had not been as evident, however, was the use of Bitcoin for the actual purpose it was created for — payments.

Figure 5 shows that recent developments are starting to alter that perception.

Figure 5. What is Bitcoin? Part 1



Source: Citi Business Advisory Services

Views on Bitcoin are evolving. Rather than the main focus being on the technology's potential and the mechanics of the payment network, there is increasing focus on two other aspects of Bitcoin. The first is its resistance to censorship.

Bitcoin is not backed by any government. The supply and demand is entirely dictated by the free market, not political or monetary policy. This positions Bitcoin as an alternative currency for those looking to operate outside their domestic economies. This is especially true for countries where de-stabilizing forces may be devaluing their native currency and making it difficult to access U.S. dollars or other fiat currencies used in global trade. It also offers a clear alternative to those looking to reduce their reliance on the U.S. dollar based on political, economic, or trade related concerns.

Despite their most ardent wishes, it might prove to be almost impossible for a government to shut down access to Bitcoin and other cryptocurrencies or prevent its ownership or usage without what would effectively amount to a shutdown of the global Internet.³⁴ Today, access to the Bitcoin network is enabled by satellites in areas with unreliable or no Internet connection, which further reinforces its censorship-resistant properties.³⁵

The second area of growing focus refers to Bitcoin's ability to act as a store of value. This is a fancy way of saying it protects purchasing power in uncertain times. As awareness and understanding of Bitcoin grows, there is shift in thinking underway that can be summarized by an expanding set of questions. Beyond wanting to know how Bitcoin works and what it is worth, more exploration is now occurring around how it can be used.

Bitcoin as a Payment Option Moves Toward the Mainstream

For a brand new innovation, it is somewhat unusual to see the Bitcoin community already has its own holiday — Bitcoin Pizza Day. On May 22, 2020, the industry celebrated the 10-year anniversary of this auspicious event.

Back in 2010, when Bitcoin was a little over a year old, Laszlo Hanyecz ordered two large pizzas and paid with Bitcoin. This is believed to be the first transaction using a cryptocurrency to pay for a real-world product. The price of Bitcoin at the time was worth less than one penny (\$0.003) and the pizzas cost Laszlo \$30 (with tip). With Bitcoin prices in early 2021 near \$45,000, the 10,000 Bitcoin used to pay for the two pizzas would be worth nearly \$450 million at current prices.³⁶ The original order has since become part of Bitcoin folklore and is highlighted in Figure 6.

Figure 6. First Real World Transaction: Bitcoin for Pizza

laszlo
Full Member
Activity: 199
Merit: 487

Pizza for bitcoins?
May 18, 2010, 12:35:20 AM
Merited by DaRude (50), Seccour (50), Vod (20), alani123 (12), OgNasty (10), Nomad88 (10), Totscha (10), TimtheYoutuber (10), the_poet (10), arthurbonora (10), leps (10), mnighawaffle (10), suchmoon (9), cheefbuza (7), d5000 (5), Betwrong (5), bitbollo (5), ebliever (5), krogthmanhattan (5), LiteBit (5), mia_houston (5), nutliah (3), klondike_bar (3), vapourminer (2), BitcoinFX (2), LFC_Bitcoin (2), LoyceV (2), gbianchi (2), cygan (2), bones261 (2), Halab (2), ChiBitCity (2), filippone (2), crypto_curious (2), ivaxmm (2), malevolent (1), EFS (1), JayJuanGee (1), iluvbitcoins (1), Hi-TEC99 (1), S3cco (1), batang_bitcoin (1), ETPBitcoin (1), digit (1), coolcoinz (1), Astargath (1), TheQuin (1), JackTheKing (1), frankenmint (1), bitart (1), lukax8 (1), Julien_Olympic (1), apoorvathey (1), o_e_l_e_o (1), JanEmil (1), amishmanish (1), ellanise (1), Toxic2040 (1), DireWolfM14 (1), VB1001 (1), pushups44 (1), chink (1), taserz (1), Financisto (1), invincible49 (1), tim-bc (1), fishfishfish313 (1), nullius (1), SimpleFX (1), GazetaBitcoin (1), BobLawblaw (1), thirdprize (1), Toughit (1), barjan (1), M-BTC (1), dektor (1), lonchafina (1), grinbuck (1), alia (1), inkling (1), Kda2018 (1)

I'll pay 10,000 bitcoins for a couple of pizzas.. like maybe 2 large ones so I have some left over for the next day. I like having left over pizza to nibble on later. You can make the pizza yourself and bring it to my house or order it for me from a delivery place, but what I'm aiming for is getting food delivered in exchange for bitcoins where I don't have to order or prepare it myself, kind of like ordering a 'breakfast platter' at a hotel or something, they just bring you something to eat and you're happy!

I like things like onions, peppers, sausage, mushrooms, tomatoes, pepperoni, etc.. just standard stuff no weird fish topping or anything like that. I also like regular cheese pizzas which may be cheaper to prepare or otherwise acquire.

If you're interested please let me know and we can work out a deal.

Thanks,
Laszlo

Source: Bitcointalk

³⁴ "Even China Can't Kill Bitcoin", Elaine Ou, [Bloomberg](#), February 23, 2017.

³⁵ "Bitcoin Satellite", [BitMEX Research](#), September 14, 2020.

³⁶ "A \$200 Million Pizza! Here's How Bitcoin Made that Possible", Matt McCall, [Nasdaq](#), December 2, 2020.

Novelty uses of Bitcoin dominated for the next several years with the Millennial tilt of many early proponents making fast food a favorite target. Reportedly, Burger King's outlets in some South American countries and its app in Germany accept Bitcoin and other cryptocurrency payments.³⁷ KFC offered a limited time "Bitcoin Bucket" of chicken for its online delivery customers.³⁸ There is even a crypto project for ordering pizza underway called Lightening Pizza allowing you to pay for Domino's in Bitcoin.³⁹

Other organizations have also jumped in to embrace Bitcoin. The American Cancer Society set up a Cancer Crypto Fund which seeks to raise at least \$1.0 million to fund ongoing research initiatives.⁴⁰ Wikileaks also accepts donations in Bitcoin. Amazon's game streaming platform, Twitch, accepts Bitcoin as payment for its services. Overstock partnered with a global crypto exchange to allow Bitcoin payments for online orders. AT&T provides a cryptocurrency payment option to customers through BitPay. Microsoft allows the use of Bitcoin to top-up a user's account. The Dallas Mavericks basketball team accepts Bitcoin as a method of payment for both game tickets and merchandise. The Miami Dolphins football team intends to give home game attendees the ability to pay with Bitcoin when purchasing tickets for the team's charitable raffle.

Several large companies speak openly about holding Bitcoin as part of their corporate treasury. MicroStrategy, the largest independent publicly-traded business intelligence company, announced it holds 70,470 Bitcoins, which were acquired at an aggregate purchase price of approximately \$1.125 billion as of December 21, 2020.⁴¹ Company leaders explained the firm believes that Bitcoin "as the world's most widely-adopted cryptocurrency, is a dependable store of value" and they "continue to believe Bitcoin will provide the opportunity for better returns and preserve the value of our capital over time, compared to holding cash."⁴² Publicly listed Marathon Patent Group noted in early 2021 they had purchased \$150 million worth of Bitcoin for their treasury. "We believe that holding part of our treasury reserves in Bitcoin will be a better long-term strategy than holding U.S. dollars," the CEO announced.⁴³ More recently, Tesla announced they had purchased \$1.5 billion of Bitcoin in order to gain "more flexibility to further diversify and maximize returns on our cash" and they will also allow customers to purchase their products using Bitcoin.⁴⁴ This announcement added to the wave of companies adopting Bitcoin and helped push the cryptocurrency to new highs.

³⁷ "Who Accepts Bitcoin as Payment?", Ofir Beigel, [99Bitcoins](#), January 7, 2021.

³⁸ Ibid.

³⁹ "A \$200 Million Pizza! Here's How Bitcoin Made that Possible", Matt McCall, [NASDAQ](#), December 2, 2020.

⁴⁰ "American Cancer Society Launches First Ever Crypto Cancer Fund", Sam Bourgi, [Cointelegraph](#), January 26, 2021.

⁴¹ "MicroStrategy Announces Over \$1B in Total Bitcoin Purchases in 2020", [MicroStrategy](#), December 21, 2020.

⁴² Ibid.

⁴³ "Nasdaq-listed Marathon Patent Group Buys \$150 Million Worth of Bitcoin as Part of Company's Treasury Reserves," Yogita Khatri, [The Block](#), January 25, 2021.

⁴⁴ "Tesla buys \$1.5 billion in bitcoin, plans to accept it as payment", Steve Kovach, [CNBC](#), February 8, 2021.

A 2020 survey by HSB reveals that 36% of small-medium businesses in the U.S. accept Bitcoin.⁴⁵ While this figure seems wildly optimistic, there has been a notable migration of Bitcoin and other cryptocurrencies onto consumer-focused platforms. This is helping to not only raise its profile but increase the perception that Bitcoin is another currency that looks, acts, and can be used just like U.S. dollars. Some of this has been due to the willingness of mainline apps to incorporate Bitcoin.

Early iterations focused on the trading, not the spending of Bitcoin as discussed in Section I. Square has been offering crypto buying and selling in its popular peer-to-peer payment Cash app since 2018.

Moves such as these helped pave the way for PayPal's October 2020 announcement that it would allow U.S. account holders to buy, sell, and hold cryptocurrencies, but more importantly, to shop with them at its 26 million merchants. The company also expects to expand the service to Venmo, its peer-to-peer payment app popular with younger consumers, during the first half of 2021.⁴⁶

The move makes PayPal one of the largest companies globally to give consumers access to cryptocurrencies and its willingness to allow it to be used within its merchant network is a bridge to potential wider adoption. In their announced approach, PayPal will allow individuals to pay with Bitcoin, but they will settle with their merchants through traditional or fiat currencies.⁴⁷ This will protect merchants from the volatility of Bitcoin and other cryptocurrencies, but also allow them to track how demand for payments in Bitcoin progress.

The journey of Bitcoin into the real world is also showing up in another form. There are a growing number of Bitcoin automated teller machines (ATMs) across the globe helping to cement the view that Bitcoin is money, just like the nation's fiat currency. Supported by the coronavirus-induced shift toward contactless payments, Bitcoin ATM installations increased by +85% in 2020 to 11,798 terminals, outpacing the previous year's near +50% rise by a significant margin, according to data source Coin ATM Radar. A Bitcoin ATM allows a person to purchase the cryptocurrency by using cash or a debit card. Some machines facilitate the purchase of Bitcoin and the sale of the cryptocurrency for cash. The U.S. added over 800 ATMs in October 2020 alone and is the leading cryptocurrency adopter followed by Canada and Germany.⁴⁸

New programs announced by Visa and Mastercard are further enhancing awareness and underscoring the idea that Bitcoin can be spent. Visa and BlockFi partnered to release the first Bitcoin Rewards Visa Credit Card. Cardholders will earn 1.5% cash back on all purchases which will be automatically converted to Bitcoin and placed into a BlockFi account every month. The Bitcoin held in the account can be withdrawn, earn interest, be traded, or be used as collateral toward a crypto-backed loan. The card will have a \$200 annual fee, but it can be offset in the first year as the card's welcome bonus allows users to earn \$250 in Bitcoin after spending \$3,000 or more on the credit card within the first 3 months from account opening.⁴⁹

⁴⁵ "Who Accepts Bitcoin as Payment?", Ofir Beigel, [99Bitcoins](#), January 7, 2021.

⁴⁶ Ibid.

⁴⁷ Ibid.

⁴⁸ "Number of Bitcoin ATMs Up 85% This Year as Coronavirus Drives Adoption", Omar Godbole, [CoinDesk](#), November 11, 2020.

⁴⁹ "Visa Backs the First Ever Credit Card to Offer Bitcoin Rewards", Alexandria White, [CNBC](#), December 2, 2020.

Seen as “nice to haves” in the U.S. and developed markets, the ability to use Bitcoin and other cryptocurrencies for payments in countries where there is less economic certainty is becoming an even more important consideration.

Indications are that a quiet Bitcoin boom is currently unfolding in Africa, driven by payments from small businesses as well as remittances sent home from migrant workers.

- Monthly cryptocurrency transfers to and from Africa of under \$10,000 — typically made by individuals and small businesses — jumped more than +55% to reach \$316 million in June 2020 according Chainalysis.⁵⁰
- The number of monthly money transfers also rose by almost half, surpassing 600,700.⁵¹
- Facilitating all of this was a +55% jump in monthly Bitcoin trading volumes of all market participants in South Africa and Nigeria to more than \$536 million in August 2020.⁵²

Many case studies have been done illustrating how Africa has leapfrogged in the build-out of its financial ecosystem, foregoing the establishment of a robust banking industry and instead jumping quickly to mobile digital wallets. Tech-savvy residents are used to digital cash, making the region particularly well-positioned to consider Bitcoin and other cryptocurrencies. Difficulties obtaining U.S. dollars, the de facto currency of global trade, are exacerbated in the region due to weak local currencies and complex bureaucracy that complicates money transfers. These issues helped accelerate the push to explore Bitcoin.

African merchants highlight how Bitcoin is helping make their businesses more nimble and profitable and allowing African natives working in places like Europe and North America to hang on to more of the earnings they send home. Small cryptocurrency transfers in June 2020 alone rose to 120,000 in June 2020 (+55% year-over-year) worth nearly \$56 million (+50% year-over year).⁵³

A country with economic pressures struggling with currency devaluation, Nigeria’s oil-dependent economy has been rocked by low crude oil prices and COVID-19. The central bank has twice devalued the Naira in 2020, forcing importers to pay more for increasingly scarce dollars.⁵⁴

All of these developments highlight how Bitcoin as a payment option is beginning to move toward the mainstream. Growing use from both developed nations and emerging economies are working to cement Bitcoin’s reputation as a store of value and making its censorship-resistant attributes increasingly important. In turn, increased uptake is helping to spur a maturation of the Bitcoin ecosystem as more money comes in and more opportunities exist to enhance the utility of those holdings.

⁵⁰ “How Bitcoin Met the Real World in Africa”, Alexis Akwagyiram and Tom Wilson, [Reuters](#), September 8, 2020.

⁵¹ Ibid.

⁵² Ibid.

⁵³ Ibid.

⁵⁴ “Nigeria Weakens the Naira to Record Low in Year-End Trade”, Tope Alake, [Bloomberg](#), December 31, 2020.

“ Bitcoin is the first global payment system that's accessible to anyone in the world.

– JONATHAN LEVIN, CHAINALYSIS

”

“ Bitcoin is the logical progression of money. It offers the ability to transfer value digitally without a central intermediary. Money is simply evolving as it has done for centuries. Bitcoin is the money of the 21st century and beyond.

– TIM RICE, COIN METRICS

”

“ I think Bitcoin is a global leveling opportunity for everyone to participate in the financial ecosystem for the first time. Emerging countries have been driving adoption of digital currency out of necessity as a way of cleaning the historic challenges with cash. With the right participants, we have a chance to clean up financial systems while making financial products and engagement far more accessible.

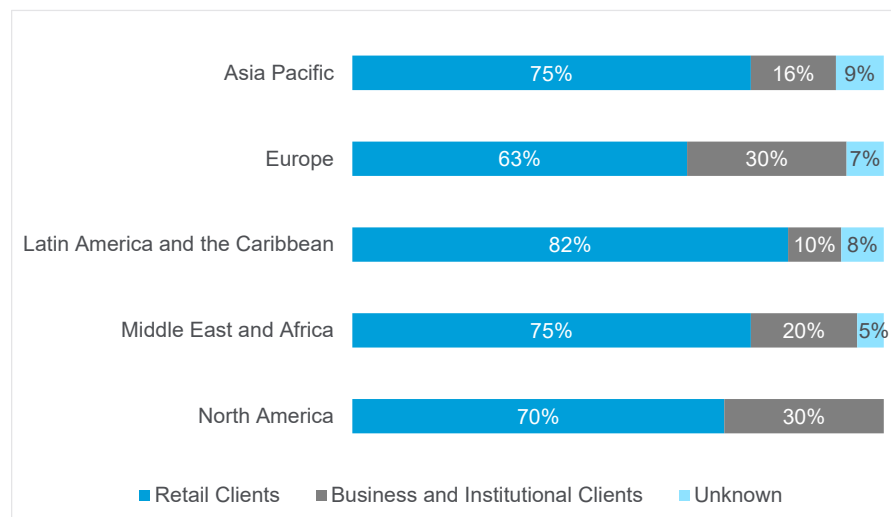
– JAMES STICKLAND, ELWOOD ASSET MANAGEMENT

”

Bitcoin Exchanges Expand Options as Bank-Like Services for Retail Emerge

Bitcoin's development arc has followed an unusual path. Being grassroots driven, relegated to the fringes of the financial system, and lacking any regulatory clarity for much of its existence, it has reversed the normal pattern of capital deployment. Rather than institutional activity driving the growth of the industry, Bitcoin has instead been primarily a retail-focused endeavor. This is shown in Figure 7.

Figure 7. Customer Base Breakdown by Type (Share of Total Users)



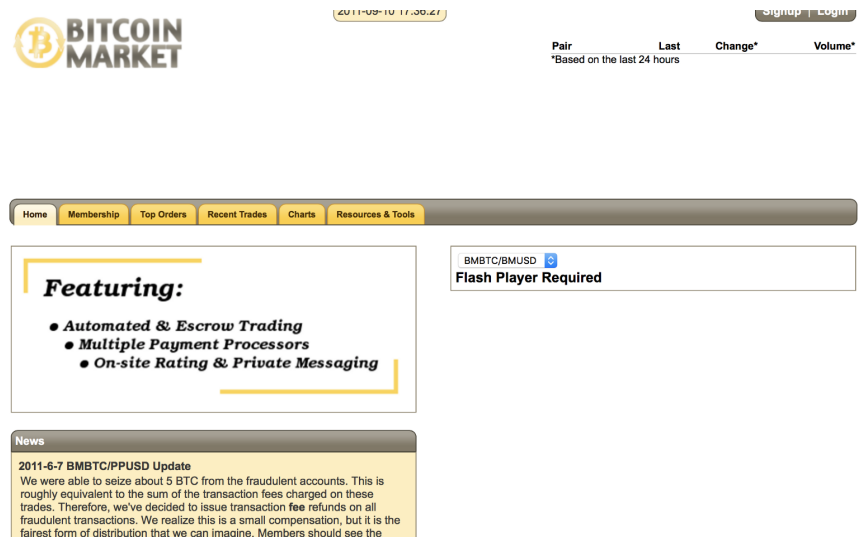
Source: Apoline Blandin, "3rd Global Cryptoasset Benchmarking Study", University of Cambridge Judge Business School, September 2020.

These retail roots are evident in the early development of the Bitcoin infrastructure.

Bitcoin Exchanges

Exchanges are the oldest and continue to be by far the most cash-generative crypto businesses. In the early days of Bitcoin's existence, the only way to obtain Bitcoin, outside of mining, was to trade it via online Bitcoin forums or through Internet chat sites. This was a trust-based arrangement requiring a buyer or seller to rely on the honesty of the individual on the other side of the transaction since there were few if any Bitcoin escrow services to act as intermediaries. By 2010, however, the first crypto exchange launched. This is shown in Figure 8.

Figure 8. First Crypto Exchange: Bitcoin Market Launched



Source: Whittemore, Nathaniel and Clay Collins, "A History of Crypto Exchanges: A Look at Our Industry's Most Powerful Institutions"

At the time, the exchange founder wrote in a Bitcoin forum, “I am trying to create a market where Bitcoins are treated as a commodity. People will be able to trade Bitcoins for dollars and speculate on the value. In theory, this will establish a real-time exchange rate so we will all have a clue what the current value of a Bitcoin is, compared to a dollar.”⁵⁵

Unlike traditional exchanges such as the New York Stock Exchange (NYSE) which operate on a business-to-business (B2B) model from inception, most crypto exchanges started out as vertically-integrated business-to-consumer (B2C) platforms. The exchange performed order matching, custody, and settlement — functions typically segregated for an institutional client.

Most operated in uncertain if not gray areas from a regulatory perspective during the early years of their existence. The vulnerabilities of this grassroots approach to development soon became evident. The significant increase in demand for crypto trading that occurred during the 2017-18 rally exposed weaknesses in the technology infrastructure. Exchanges struggled to cope with increased loads and frequently suffered outages. Trading APIs were wildly unreliable. In addition, liquidity was thin and moderate-sized trade tickets would often lead to significant slippage. As a result, infrastructure and liquidity were sub-optimal for the deployment of institutional capital. In the intervening years, significant upgrades have occurred. This has set the stage for growth in institutional participation to grow, as we discuss in the next section.

Today, the largest Bitcoin exchanges are maturing with many opting to become regulated and licensed businesses. Top entities include (but not exclusively): Kraken, which was founded in 2011 and has become today’s largest cryptocurrency exchange for Euro volume and liquidity, and is a partner to the first cryptocurrency bank; Bitstamp, based out of Europe, was also founded in 2011 and provides worldwide availability; Gemini, another full regulated and licensed U.S. Bitcoin exchange available to customers in the U.S., Canada, Hong Kong, Japan,

⁵⁵ “Bitcoin History Part 6: The First Bitcoin Exchange”, Kai Sedgwick, [Bitcoin.com](https://bitcoin.com), December 25, 2018.

Singapore, South Korea, and the U.K.⁵⁶ These are just a few examples. There are many other exchanges or direct peer-to-peer lending sites offering similar services.

Bitcoin Savings, Lending & Borrowing

As participation in Bitcoin and other altcoins increased, balances in digital wallets began to rise. When the market crashed in 2018, many owners did not want to exit their holdings and sell at a loss. They were willing to hold on until their positions recovered or perhaps longer as they believed in the upside potential of the cryptocurrency space.

This marked a shift from earlier activity. Rather than looking at Bitcoin and the other cryptocurrencies as speculative opportunities to try and buy low and sell high, some newer participants began to look at their holdings as investments they wanted to keep for the long-term. In the crypto world, those that hang onto their coins no matter the volatility are often said to “HODL”. While attributed to a typo in a Bitcoin forum for the word “hold”, it has since entered the lexicon of the community and has been extended to mean ‘holding on for dear life’.⁵⁷

The desire to HODL can very much be linked to the psychology of bull market behavior. Having seen the value of their coins run up sharply once to new highs, there is a tendency to expect that pattern to re-occur and thus the desire to hang onto, not spend, their Bitcoin and altcoin holdings to benefit from the hoped-for future increase. Indeed, there is a psychological tendency for gains to beget gains. In a book titled *A Wealth of Common Sense*, the author presents data showing that after the S&P 500 hit all-time highs between 1950 and 2016, it was higher one year later 74% of the time. Three years later it was higher 87% of the time and five years out it was higher 83% of the time.⁵⁸

Looking at the stagnant wallet balances of ‘hodlers’, new market entrants began to think about ways to treat these balances like a ‘bank’ would — paying interest on the holdings, using them as collateral, and lending them. This led to the emergence of a new set of crypto banks.

Silvergate, one of the market leaders in the space, leveraged their payments network — Silvergate Exchange Network (SEN) — to process \$59 billion of transactions in the fourth quarter of 2020, up +62% over third quarter levels. The bank’s crypto-related deposits reached \$3.7 billion with 76 crypto exchanges accounting for 47% of such holdings. Plans are underway to monetize the bank’s Bitcoin payments platform in 2021.⁵⁹ New York’s Signature Bank indicated in early 2021 they had reached \$10 billion in crypto deposits representing 16% of its total holdings. The bank’s blockchain-based payments platform, Signet, is the main driver of deposit growth. The CEO recently noted that Signature banks the top five crypto exchanges, and is now offering retail banking services through those relationships.⁶⁰ Silvergate, too, is looking at expanding their retail banking services.⁶¹

⁵⁶ “The Best Cryptocurrency Exchanges: Most Comprehensive Guide List”, Ameer Rosic, [Blockgeeks](#).

⁵⁷ “HODL”, Jake Frankenfield, [Investopedia](#), June 30, 2020.

⁵⁸ “A \$200 Million Pizza! Here’s How Bitcoin Made that Possible”, Matt McCall, [Nasdaq](#), December 2nd, 2020.

⁵⁹ “Silvergate Results Show Q4 Momentum as Bank Starts Year with \$200 Million Follow-On Public Offering”, Aislinn Keely, [The Block](#), January 20, 2021.

⁶⁰ Ibid.

⁶¹ Ibid.

While Silvergate and Signature are banks for crypto businesses, there are other players beginning to offer bank-like services for crypto holdings. Their offerings include the following:

- **Crypto-based Savings Accounts:** These savings accounts are not on par with a typical commercial bank savings account. The Bitcoin and altcoins held in the account are not backed by any type of government insurance and funds in the account could be lost. In that sense, signing up for these types of savings is simply accessing a different type of Bitcoin and cryptocurrency investment product.

In crypto-based savings accounts, the individual's coins are lent out to other people who can use the crypto for a defined period of time. In exchange, the borrower promises to pay the wallet owner interest on the Bitcoin or other altcoins. Yields on cryptocurrency savings accounts range from about 4% to 8%, significantly above traditional savings, particularly in today's low interest rate environment. This is because crypto 'banks' cannot produce money so they instead attract investors with high yields in order to build balances. The supply and demand for crypto holdings thus drive the interest rate.⁶²

Crypto-deposits equivalent to the interest rate are put into the individual's wallet in Bitcoin or other altcoins, based on the individual's preference. Depending on the crypto bank offering the service, there may be restrictions on how frequently an individual can withdraw Bitcoin and other cryptocurrencies from the account. One peculiarity of these savings accounts in their current form is that the interest payments may not compound whereas the initial deposits will continue to compound.⁶³

Top providers in the space offering high yield savings accounts for Bitcoin include BlockFi and Celsius Network. Leading exchanges such as Gemini, and Kraken also allow wallet owners to earn interest on their crypto balances. On the institutional side, lending businesses such as Genesis Capital, enable yield generation on passive crypto balances for institutional clients.

- **Crypto Lending and Borrowing:** Crypto lending and borrowing are often offered by the same providers that support crypto savings accounts as well as by another emerging set of specialty providers. Individuals who choose to lend their crypto holdings receive the interest rate pay out as their passive income stream.

Those who choose to borrow crypto are able to use their existing Bitcoin or other altcoins as collateral to secure loans. The borrower's existing Bitcoin or altcoin holdings are held in the lender platforms' collateral account and will be returned when the loan is paid back. The platform would then provide the borrower a pre-loaded debit card with the loan amount to facilitate their spending or deposit the requested cryptocurrency coins into the borrower's wallet. The borrower is then free to convert that cryptocurrency into cash or spend it in its crypto form.

This expansion in services to savings, lending, and borrowing all relate to the growing perception of Bitcoin and other altcoins as a payment option as well as a speculative investment. The development of the ecosystem as primarily a retail pursuit and the refusal of brand-name commercial banks to provide funding for crypto markets has resulted in exceptionally high interest rate payouts.

⁶² "The Top Crypto Savings Accounts of 2021, Robert Farrington, [The College Investor](#), January 20, 2021.

⁶³ Ibid.

Some of the more intrepid institutional investment managers dealing with low to zero interest rate options in the traditional markets have begun eyeing the crypto space as a potential source of returns.

Bitcoin's digital scarcity is also proving to be an important attraction for institutional investors and is helping to drive yet a third iteration in the perception of Bitcoin.

“ People often ask what innovation is crypto bringing to the table. The Uniswap protocol brings transparent pricing and continuous liquidity for trading, and it is doing so without large centralized market makers. Never before has the average investor had access to participate in the financial system this way.

– MATTEO LEIBOWITZ, UNISWAP

”

“ The first thing to note is that the retail lending is similar to Reg T or margin lending in a brokerage account except with cryptocurrencies instead of securities acting as collateral. The advantage is that in lending against crypto, the market trades 24/7.

– ZAC PRINCE, BLOCKFI

”

“ The crypto lending market has way more use of proceeds than purely shorting or hedging. We have crypto-native businesses looking for growth capital and their working capital is in Bitcoin so they would rather have a Bitcoin loan. For a small segment of our overall originations, we are like a commercial bank making loans for their businesses.

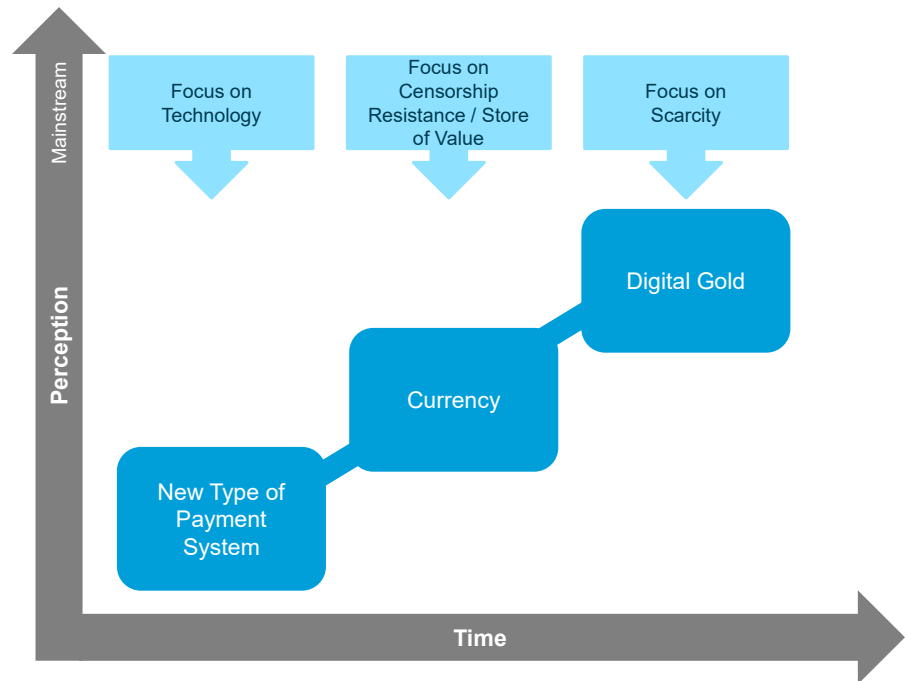
– MICHAEL MORO, GENESIS TRADING

”

Views that Bitcoin Represents 'Digital Gold' Gain Traction

Retail market participants' instinct to 'HODL' underscores a nuanced shift in perceptions about Bitcoin. While it is certainly a new type of technology and a unique payment network and its use as a currency in global payments is increasing, the digital scarcity Bitcoin has engineered also makes it a unique asset and one that has a permanently finite supply. The fact it is 'mined' has caused many market participants to begin to dub it 'digital gold'. This evolution of views is highlighted in Figure 9.

Figure 9. What is Bitcoin? Part 2



Source: Citi Business Advisory Services

Beyond being mined, other similarities exist between Bitcoin and gold. The supply of both is seen as finite, though the amount of gold still existing in the earth is unknown whereas the amount of un-mined Bitcoin can be precisely calculated. Gold can be divided into ever smaller amounts, from ounces to half ounces, quarter ounces, grams etc. Bitcoin can be divided into Satoshi units equating to 100 millionth of one Bitcoin.

Those opposed to the analogy insist that Bitcoin has no intrinsic value because it is not a tangible asset, and being digital, only has value because people believe it has value. Those perceptions could shift, they argue, and leave Bitcoin worthless.

Others point to the underlying technology, the volume of activity occurring in the Bitcoin network, the services being built around the asset, and the brand value it has created which in turn has inspired a Cambrian explosion of innovation and an entire ecosystem of altcoins and new business models as countering the intrinsic value argument. Indeed, for many, Bitcoin is seen as the 'North Star' of a whole new emerging economy as we will explore in Section III.

Signs that institutional participation in Bitcoin and other cryptocurrencies is on the rise is only likely to help cement that view and lend increasing legitimacy to both Bitcoin and the new ecosystem it has helped to spawn.

Institutionalization of the Ecosystem Begins to Re-Shape Landscape

For institutional investors to participate in a new asset class, it must be underpinned by a robust infrastructure able to support an efficient market. Hallmarks of that structure are its ability to deliver the benefits of market data integrity, efficient price discovery, liquidity and depth, capital efficiencies, and asset safekeeping. As crypto business models mature and as institutional demand increases, existing entities are revamping their offerings and new entrants are emerging to create institutional-level services. This is changing the profile of the on-chain ecosystem and bringing it closer into alignment with the existing financial marketplace.

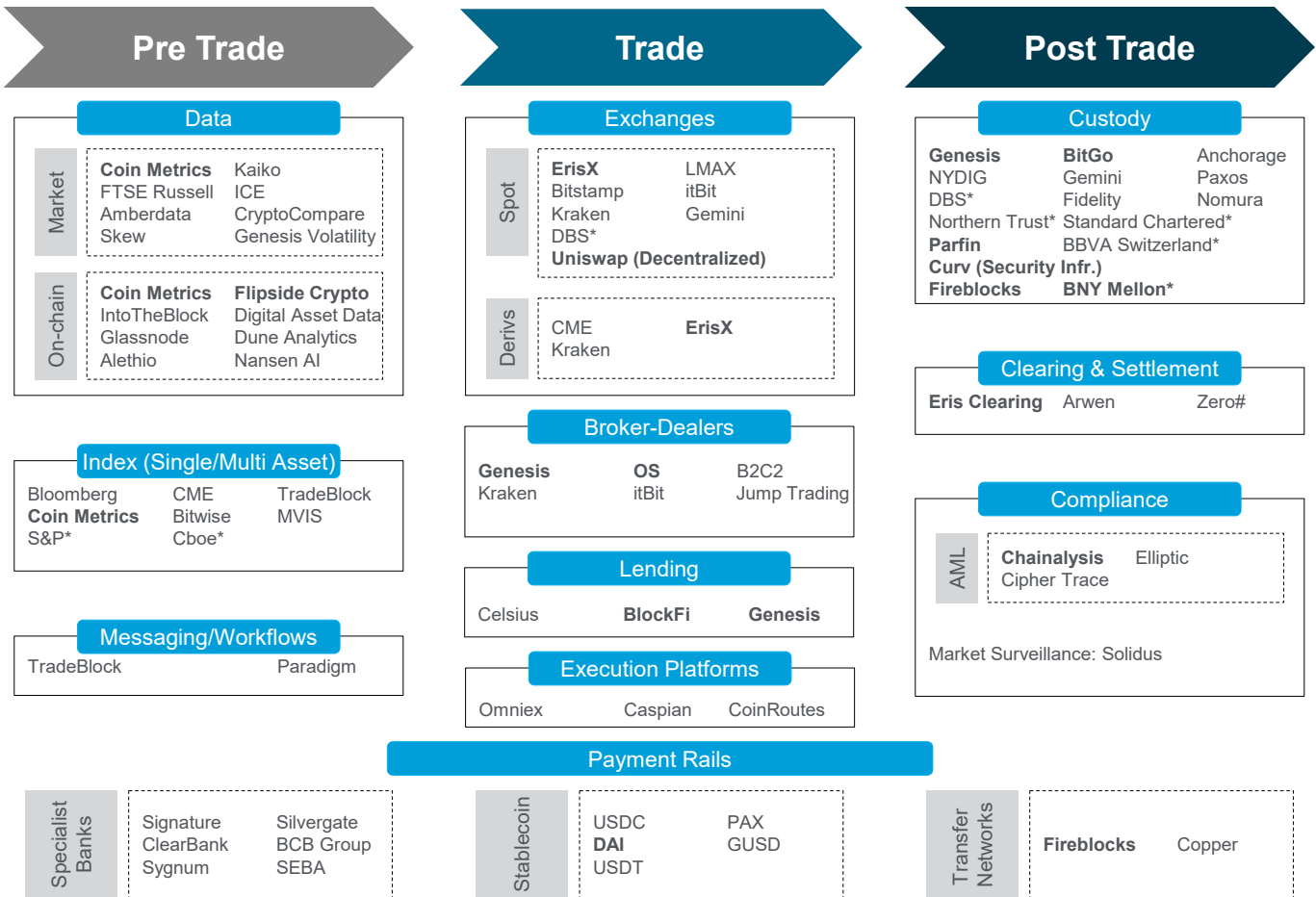
As core institutional requirements are met, new investment opportunities are also emerging providing institutional investors the opportunity to both trade in a more established manner via exchange APIs, market analytics, and OTC dealing, but to also better utilize and protect their capital via derivatives, margin financing, and prime brokerage services.

We will examine advancements in both the development of the ecosystem and the emergence of institutional trading products to help frame why more institutional investors are now entering the Bitcoin and cryptocurrency domain. Indeed, one of the key differences between the 2017-2018 run up in Bitcoin prices and the current market run to new highs is the growing participation of institutional investors in the Bitcoin and cryptocurrency marketplace.

Maturation of the Market Structure to Support Institutional Investors

In a move away from the vertically-integrated services model developed to serve retail participants, a broadening set of providers are now creating discrete services to address specific phases of the trade lifecycle, much like what exists for more mature asset classes. This is shown in Figure 10.

Figure 10. Institutionalization of the Cryptocurrency Ecosystem



Note: * Announced, not launched; ** Bolded firms were interviewed for this report; ***Some firms provide additional services than those listed above.

The table above is not all-inclusive and some companies have been intentionally omitted.

Source: Citi Business Advisory Services based on company websites

Three areas of enhancement have been especially important in helping to create a more institutional playing field — advancements in data, exchange and trade offerings, and custody.

Data:

With any asset class, data is the starting point of any decisions on investments or liquidity provision. Investors and liquidity providers use market and order book information (historical and real time) to inform their investments, develop trading strategies, and enhance risk management practices. The utility of data extends to indexes and reference benchmarks, which are used to create investment products, and settle trillions worth of derivative contracts every day. Therefore, data integrity is foundational for any well-functioning market.

Data in crypto-assets can be classified into market data and on-chain data. While market data exists across all asset classes, on-chain data is unique to this asset class, enabling analysis of these assets in ways not possible for traditional investment products.

- **Market Data:** Market data includes live and historical trade information such as asset price, bid-offer trading volumes, and order book data. Crypto-asset market data is similar to exchange traded products with familiar data elements (price, bid/offer, order book, etc.), but very different in substance. Unlike traditional assets where the exchanges usually license market data as a separate product offering, almost all crypto-asset exchanges provide free market data access through hosted APIs.

While this democratizes access to market data, directly using this data in the investment process has thus far proven difficult. Liquidity is fragmented across a large number of cryptocurrency exchanges, each of which trades their own set of crypto-fiat and crypto-crypto trading pairs. This means there may be multiple prices and multiple bid-offers for the same pair in many venues. Moreover, the range of quoted pairs may vary from exchange to exchange as there is as of yet no standardization of cryptocurrency coverage.

There are also concerns about the quality of market data reported by the exchanges, including issues of exaggeration of trading volumes that have raised questions on 95% of reported trading volumes.⁶⁴ Given the relative youth of such exchanges (even the oldest crypto-exchanges are just coming up on 10 years of operations) further upgrades and standardization may be required to build broad institutional confidence.

Yet, these same inefficiencies are making the current landscape attractive for high frequency and quantitative traders able to build models taking advantage of the fragmentation. Co-location services allowing algorithms to access exchange data near its point of origin are emerging to facilitate such strategies. Offerings from exchange providers like ErisX and OSL are facilitating these investment approaches, which in turn are helping to narrow spreads and price discrepancies across trading venues, according to analysis presented in a 2019 white paper, *Buying Bitcoin*, published by the New York Digital Investment Group.⁶⁵

- **On-chain Data:** On-chain data includes information pertaining to the transactional activity of the crypto-asset on its native blockchain network. As described in Section I, every Bitcoin trade is added to the blockchain ledger and that entire ledger, including the history of every transaction ever made in the ledger, is available to any user running a node on that network.

While the data contained in these ledgers may vary from one blockchain to another, it generally includes: transaction level data such as sender/recipient addresses, transfer value, transaction fee, and balances on addresses; block data such as timestamp, included transactions, mined units; and smart contract information such as invocation and usage data for blockchain with smart contract capabilities.

On-chain data enables analysis and monitoring, real-time and retrospective, of all transactions happening within this economy. This makes on-chain data useful not only for fundamental analysis of crypto-assets, but for Anti Money Laundering and other use cases as well.

⁶⁴ “Economic and Non-Economic Trading in Bitcoin: Exploring the Real Spot Market For The World’s First Digital Commodity”, Matthew Hougan, Hong Kim, and Micah Lerner, [Bitwise Asset Management](#), May 24, 2019.

⁶⁵ “Crypto Exchanges are Benefitting from Algorithmic Trading: Here’s How”, Matthew Trudeau, [CoinDesk](#), July 27, 2019.

Thus far on-chain data has largely been used for creating client research, deeper narratives around Bitcoin and Ethereum, or to get information on fundamental data such as active addresses. This is beginning to change. A few algorithmic funds have started to mine this data for trading signals. Increased contextualization of on-chain data over time may unleash data-driven investing strategies based on data generated by the blockchain itself.

- **More Focus on Data Governance and Compliance:** While institutional investors early to the game were generally more tech savvy and focused on the market inefficiencies, later entrants looking to deploy capital or build businesses around crypto-assets are demanding a higher bar on data governance and compliance. To meet those needs, many are starting to look at third-party data providers such as Coin Metrics. Such data providers have developed internal policies and procedures and undergone system and organization controls (SOC2) audits by third parties to clear barriers in order to meet institutional thresholds, making it easier for participants to enter the space.

More compliance and risk services that leverage the transparency of on-chain data are also emerging. Asia's OSL exchange created a risk routine assessing the 'purity' of each coin coming into their ecosystem and holds it in quarantine until the origins can be examined and a risk-rating attached to the coin based on its provenance. Coins with questionable histories are segregated and reported to authorities if background investigations uncover illicit roots.

Exchange & Trading Enhancements:

Although retail clients continue to drive the majority of exchange volumes, a small number of crypto exchanges have sought differentiation by re-vamping their offerings to align to institutional grade requirements. These exchanges are pursuing regulatory licensing, improving their governance with enhanced risk and control procedures, forging greater connectivity to the off-chain banking system, and upgrading their technology infrastructures.

Trading APIs for this group are robust, well documented, and are based on widely-used Financial Information eXchange (FIX) protocols, common across traditional broker-dealers, institutional investors, and the algorithmic trading community focusing on high frequency and quantitative strategies. Based on these enhancements, this small group of exchanges have lead price discovery for Bitcoin and have benefitted from the narrowing bid-ask spreads and price discrepancies cited earlier.⁶⁶

Recent announcements from traditional financial market institutions and banks about their intentions to launch crypto-exchanges underscore how the landscape is maturing. LMAX, a leading foreign exchange trading venue, launched an institutional-only crypto exchange in 2018 and Development Bank of Singapore (DBS) announced plans for a crypto exchange in late 2020.⁶⁷

⁶⁶ "An Analysis of Price Discovery in Bitcoin Spot Markets", Greg Cipolaro, [Digital Asset Research](#), January 15, 2020.

⁶⁷ "DBS to launch full-service digital exchange - providing tokenization, trading and custody ecosystem for digital assets", [DBS](#), December 10, 2020.

Signs of how far the alignment of traditional and crypto-trading has progressed are reflected in the user interface design of leading exchange offerings as shown in **Error! Reference source not found.** Advanced charting, order books, trade history, and a growing set of trade analytics are hallmarks of the emerging platforms.

In addition to improvement in the spot trading infrastructure, several other trade-related developments are occurring to deepen liquidity and provide pathways to facilitate institutional trading. The first set of these relate to a broadening set of options on how to express Bitcoin and cryptocurrency positions:

- **Bitcoin Derivative Contracts:** Derivatives offer a hedging and risk management solution for those exposed to the corresponding asset, whether to protect against adverse price movements or to dampen price volatility. Understanding how to best deploy and use derivatives often requires a deeper understanding of financial market mechanics. While some offerings focused on retail participants in the Bitcoin and altcoin space have emerged, the regulatory view of these offerings has been clear. The U.K. regulators outright banned the retail marketing of such products in 2020 and U.S. regulators are turning to enforcement actions against certain retail-focused companies well-entrenched in the space.⁶⁸

Regulated crypto derivatives targeted at market professionals, however, are offering a way for institutional investors to achieve important capital management objectives. The entry of established players into this space is helping to drive increased interest.

The Chicago Mercantile Exchange's (CME) Bitcoin futures contract, is beginning to gain traction due to in part to the institutional community's comfort with the provider from a regulatory standpoint and because of the exchange's integration with existing financial plumbing. Contracts are cash-settled which removes the need for custody and delivery.

- CME's BTC futures have seen a healthy growth in volumes and open interest, becoming the largest Bitcoin futures exchange by number of open contracts. At the end of 2020, the CME's open interest stood at \$1.66 billion, accounting for 18.1% of the total global open interest of \$9.18 billion, putting the CME ahead of retail-first crypto exchanges with derivatives offerings including OKEX, Binance, Bybit, and Huobi — each of which also had \$1.0 billion or more in open positions.⁶⁹ The CME also offers options on Bitcoin futures and recently launched Ethereum futures.⁷⁰
- **Bitcoin Access Products:** Another set of regulated investment structures are emerging that eliminate the operational complexities of trading and safekeeping crypto-assets, and bridge existing financial infrastructure and crypto-assets. These offerings provide access to Bitcoin price movements and allow investors to obtain exposure to the asset without having to directly own the coins.

⁶⁸ "Dear Crypto Derivatives Industry, Let's Not Repeat 2008", Sandra Ro, [CoinDesk](#), January 20, 2021.

⁶⁹ "CME Tops in Bitcoin Futures Rankings Amid Rapidly Growing Institutional Interest", Muyao Shen, [CoinDesk](#), December 29, 2020.

⁷⁰ "CME Group to Launch Ether Futures on February 8, 2021", [CME Group](#), December 16, 2020.

- Grayscale's Bitcoin Trust (GBTC) seems to be the primary mechanism through which many institutional investors have taken an exposure to Bitcoin. GBTC is an SEC-registered investment vehicle that passively tracks Bitcoin's price. It has an open-ended fund structure — new shares are created at Net Asset Value (NAV) in the primary market at the time of subscription. GBTC shares are not redeemable and have a six-month holding period requirement before they can be traded in premier-tier OTCQX market.⁷¹⁷² At the end of December 2020, GBTC held 3.1% of *all* of the 18.6 million Bitcoin ever mined.⁷³ Assets under management (AUM) jumped from \$2.0 billion in December 2019 to \$13.1 billion at the end of 2020.⁷⁴ As a result GBTC shares have traded in the secondary markets at a significant premium to NAV for much of its existence.

Outside of the U.S., there are a number of listed investment vehicles that passively track Bitcoin's price, but none of them have been able to replicate Grayscale's GBTC success so far. These products tend to trade with a much tighter premium or discount to NAV. A listing of such products is presented in Figure 11.

Figure 11. Listed Bitcoin Investment Vehicles Outside the U.S.

Investment Vehicle	Country of Listing	Assets (\$mn) as of 12/31/20
Coinshares Bitcoin Tracker One ETN	Sweden	\$1,166
3iQ Bitcoin Fund	Canada	528
BTCetc Bitcoin Exchange Traded Cryptocurrency	Germany	352
WisdomTree Bitcoin ETP	Switzerland	168
21Shares Bitcoin ETP	Switzerland	126
VanEck Vectors Bitcoin ETN	Germany	21

Source: Bloomberg, Citi Business Advisory Services

More product innovation is anticipated as established players look at opportunities to capture the growth in the Bitcoin and cryptocurrency marketplace, but the “holy grail” of these potential products — a Bitcoin exchange-traded fund (ETF) — has not yet found favor with regulators. Cathie Wood, the CEO of Ark Investment Management said that she “doubts U.S.002E regulators will green-light a Bitcoin ETF before the original cryptocurrency's market cap hits \$2 trillion.”⁷⁵ On February 19, 2021, Bitcoin's market capitalization hit \$1 trillion.

⁷¹ “Grayscale Bitcoin Trust Fact Sheet”, [Grayscale](#), January 2021.

⁷² [Grayscale Bitcoin Trust Form](#) 10-Q, SEC.

⁷³ “Grayscale Trust (GBTC) is Key To Bitcoin Price: JP Morgan”, Rakesh Sharma, [Investopedia](#), December 23, 2020.

⁷⁴ Ibid.

⁷⁵ “Cathie Wood: Bitcoin ETF Approval Unlikely Until Market Cap Rises to About \$2T”, Danny Nelson, [Coindesk](#), January 26, 2021.

The second set of trading enhancements have to do with the emergence of more institutionally-focused service providers that are adding efficiencies and new capabilities. To some original Bitcoin proponents, drawn to the ethos of the decentralized system and committed to its anti-establishment appeal, the replication of traditional financial entities that rely on the centralization of services is signaling a troubling direction for the network. Yet, for those looking at the increased growth and acceptance of the system, these developments are seen as crucial in building confidence and broad-based appeal. The main offerings helping to spur increased institutional participation are listed below:

OTC Dealers: While in traditional asset classes such as equities and foreign exchange (FX), bank market-making desks typically provide over-the-counter (OTC) trading arrangements, a new set of dealers in the crypto space are emerging. These dealers help investors move large block trades with minimal impact on price versus exchanges where orders are broadcast and large order sizes might result in sub-optimal execution. During the early days, clients included miners or early crypto investors, however as the crypto markets have matured, client lists have expanded to include corporates, high-net worth individuals, family offices, and institutional investors.

The earliest crypto OTC desks traded as principals, assuming risk on every trade and then looking to offset trades with another counterparty or at an exchange in order to capture the bid-ask spread. This continues to be the dominant model, but with the maturation of the market and increase in liquidity, some crypto OTC desks are beginning to trade on an agency model, where they facilitate and charge a small fee for execution rather than taking on direct risk in a trade.

In another sign of maturation, OTC execution has evolved from being conducted over voice or chat, to electronic channels with APIs allowing dealers to stream prices. Over 90% of spot trades are executed electronically which is a higher percentage than in most, if not all, traditional asset classes, with clients preferring voice execution for ticket sizes in excess of \$10 million. OTC spreads for Bitcoin and altcoin trades have tightened in response to growing demand and improved execution options, narrowing from 50-200 basis points a few years ago around to only 5-10 basis points.⁷⁶

- **Crypto Prime Brokers:** The emergence of crypto prime brokers is another sign of how crypto markets are becoming more institutional. These participants aggregate execution, custody, clearing, and settlement functions through a single brokerage relationship. This helps to reduce operational complexity and improve capital usage through netting.

The emergence of such services is important given the fragmentation of the marketplace. Rather than an institution having individual wallets at every exchange, they can instead have one wallet at the prime broker that enables “best execution” by having proprietary algorithms monitoring the array of exchanges for any given trading pair and direct the client’s order via smart routing. Providing best execution is a regulatory requirement in most jurisdictions for traditional asset classes and having a crypto alternative offering comparable servicing helps to open the marketplace to a growing set of participants.

⁷⁶ “Crypto Market Structure 3.0”, [Arjun Balaji](#), October 2020.

Prime brokers also facilitate margin financing, a method by which institutions can extend their buying power by using existing holdings as collateral to borrow additional funds with which they can lever the size of their trading positions. This makes the crypto landscape more attractive to hedge fund participants who rely on these arrangements to facilitate their alternative strategies and to wealthy individuals or families looking to increase the potential return on their risk capital.

Several of the crypto prime broker offerings are now being driven by industry veterans that spent years in the prime brokerage space, also helping to build confidence in the new businesses.

Custody Services

Early custody solutions offered as part of a bundled exchange service may have sufficed for retail participants in the crypto space, but are inadequate for institutional investors. Securities laws across jurisdictions mandate institutional investors “safekeep” assets with a qualified custodian (or equivalent outside U.S.). These qualified custodians have traditionally included depository banks, trust companies, and custody banks, all of which generally possess large balance sheets. These established participants bundle their custody offerings with other value-add post-trade services.

No such players were willing, or even able, to extend their offering to assets held in digital wallets in the early years of Bitcoin. Two types of wallet solutions were available, each of which had issues, and resulted in owners having to navigate a tradeoff between asset security and asset mobility.

- **Cold Storage:** In a ‘cold’ storage model, the cryptographic key controlling the owners digital asset, which itself is a unique alphanumeric text string, is stored in an offline location not connected to the Internet. This is typically done via special hardware, but could even use QR code printed on paper.⁷⁷
- **Hot Storage:** ‘Hot’ storage wallets keep the users’ keys in a physical device or even software that’s connected to the Internet. There are both desktop and mobile versions of these wallets being connected to the Internet, and these wallets may be easier to hack and might thus be seen as less secure.⁷⁸

In both instances, account owners are wholly responsible for the protection of their account key or password. If the user loses their key or if their password is hacked, they may forever lose access to their cryptocurrency. Chain analysts estimate as of early 2021, 20% of Bitcoin appears to be in lost or otherwise stranded wallets.⁷⁹

Beyond the security concerns, there were other practical issues making both of these arrangements impractical for institutional players. In the early years of Bitcoin and cryptocurrency trading, withdrawing Bitcoin or other cryptocurrencies from cold storage took up to 48 hours due to manual redundancies such as confirmation over video calls required by custodians to prevent theft. This delay risked institutions not being able to mobilize the use of their assets to capture trading opportunities.

⁷⁷ “Hot Wallet vs. Cold Wallet: Best Way to Store Cryptocurrency”, [BitIRA](#), November 15, 2018.

⁷⁸ Ibid.

⁷⁹ “Lost Passwords Lock Billionaires Out of their Bitcoin Fortunes”, Nathaniel Popper, [The Seattle Times](#), January 12, 2021.

As a result, early investors either stored the majority of their assets in cold custody and kept a small portion in exchange hot wallets or distributed assets over multiple exchange hot wallets to diversify the risk of theft. Therefore, custody as it existed could not meet the operational scalability requirements institutional investors take for granted with traditional asset classes.

Several crypto exchanges and new market participants such as BitGo and Anchorage, undertook initiatives to upgrade their capabilities and introduce more institutionally-aligned, third-party custody offerings, spanning both hot and cold wallet solutions. These offerings provided at least some degree of insurance to protect the organization and its client assets. Newer innovations are helping to further increase confidence in their abilities.

Technology to safely keep crypto-assets has matured. Multi-party computation (MPC) cryptography for custody ensures there is no single point of failure and that a complete private key is not held in any location at any one time. MPC achieves this by distributing the authorization rights (or encrypted key shares) to store assets across multiple parties.

The MPC approach also helps reduce the complexities of key management across different blockchains with different cryptographic and technology idiosyncrasies. Policies around transaction amounts, withdrawal addresses, withdrawal windows, and approval processes can be easily configured in commercial software by companies such as Fireblocks and Curv. As a result, emerging institutional custody solutions are believed to be as secure as cold storage with the operational scalability of a hot wallet.

Growing confidence in crypto custody capabilities is being underscored by the entry of established industry participants. Fidelity announced they would allow retail custody of crypto-assets through a partnership with a major global crypto exchange back in 2017, but it was in 2020 that a more institutionally focused set of firms either launched or announced their intentions to enter the space.⁸⁰ These large banks with balance sheets in excess of \$100 billion include Northern Trust, Bank of New York Mellon, Nomura, Standard Chartered, BBVA, and DBS. The entry of traditional custodians and such well-financed players has helped support growing institutional engagement.^{81, 82, 83, 84}

Several key regulatory developments provided the clarity needed for established players to extend into the space.

⁸⁰ "Fidelity just made it easier for hedge funds and other pros to invest in cryptocurrencies", Kate Rooney, [CNBC](#), October 15, 2018.

⁸¹ "Japan megabank Nomura launches Bitcoin and crypto custody for institutional investors", Shaurya Malwa, [Cryptoslate](#), June 19, 2020.

⁸² "BBVA, Standard Chartered get into crypto-custody game", [Finextra](#), December 11, 2020.

⁸³ "DBS to Start Members-Only Digital Bourse for Crypto Assets", Chanyaporn Chanjaroen, [Bloomberg](#), December 10, 2020.

⁸⁴ "Bitcoin to Come to America's Oldest Bank, BNY Mellon", Justin Baer, [Wall Street Journal](#), February 11, 2021.

“ Digital assets have the potential to become effective tools for combating illicit financial transactions such as money laundering because of technological innovations such as blockchain analysis and coin purity. Coin purity, or 'Know Your Token' (KYT) technology, allows users to track the history of digital assets and digital wallets. If a digital asset is found to be associated with illicit activity, it is flagged by the technology for further investigation. This is one of a number of considerations before a decision is made to transact with a particular coin.

– WAYNE TRENCH, OSL

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“ Despite what the price volatility tells you, we have trended in one direction for institutional adoption. Institutional adoption never happens at a single point in time, but we are seeing a shift in the types of institutions that are participating — from an historical base of primarily trading firms and hedge funds to today where many different types of long-only investors are adding Bitcoin as part of their overall asset allocation.

– ZAC PRINCE, BLOCKFI

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“ The latter half of 2020 saw a shift in perception of digital assets by the broader market and the influx of institutional investors coming to crypto. Several factors played into this, including the pandemic, monetary expansion, the rise in Bitcoin price, and the maturing of crypto regulation. This shift continues into 2021 as institutional investors embrace crypto. Many of the early concerns, particularly around custody and security, have predominantly been solved by firms such as BitGo. In addition, we are seeing the rise of Prime Brokerage for crypto, as firms integrate custody, settlement, lending, and trading. This journey closely mimics the development of earlier alternative asset classes and we see explosive growth in the year ahead.

– NICK CARMI, BITGO

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Regulatory Announcements Start to Provide More Certainty to Established Firms

Developed outside the traditional financial system without supervision of regulators, crypto-assets were plagued by regulatory uncertainty for much of their existence. As a result, institutional investors and financial services incumbents operating under well-defined regulatory regimes, maintained a safe distance from Bitcoin. However, over the past two to three years as regulators across the world have become well-informed on crypto-assets and their nuances, they have increasingly issued guidance and/or established regulatory regimes to help guide established and emerging firms on how to engage in this emerging landscape. While this is happening at a different pace across jurisdictions, it is nevertheless a positive step towards their integration into the financial system.

Three issuances in particular are likely to have significant impact on the development of the global cryptocurrency landscape and work to increase institutional participation and potentially draw more established financial market participants into the cryptocurrency domain.

- **Financial Action Task Force (FATF) Travel Rule:** In an effort to ensure more transparency and discourage the use of Bitcoin and other cryptocurrency networks for illicit activity, the Travel Rule aims to require all originators and beneficiaries of transfers of digital funds to exchange identifying information. This would apply to virtual asset service providers (VASPs) such as cryptocurrency exchanges and wallet providers as well as financial institutions and obliged entities. Basically, this would eliminate the pseudo-anonymous aspect of Bitcoin for those accessing it via regulated entities and require customer and as well as transaction transparency.⁸⁵

Originally announced in June 2019, the one-year review by FATF found that 35 of 54 reporting jurisdictions advised they have now implemented the revised FATF standards, with 32 of these regulating VASPs and three choosing to prohibit the operation of VASPs. The other 19 jurisdictions have not yet implemented the revised standards in their national law. FATF notes “there has been progress in the development of technological solutions to enable implementation of the travel rule for VASPs though there remain issues to be addressed by the public and private sectors.”⁸⁶

- **U.S. Office of the Comptroller of the Currency (OCC) and Securities Exchange Commission (SEC) Cryptocurrency Custody Letters:** In July 2020, the OCC published a letter clarifying their view that national banks and federal savings associations have the authority to provide cryptocurrency custody services for their customers. The OCC specifically recognized the importance of digital assets and the authority for banks to provide safekeeping for such assets. They indicated that providing cryptocurrency custody services, including holding unique cryptographic keys associated with cryptocurrency, is a modern form of traditional bank activities.⁸⁷ With U.S. banks ranking among the top global custodians, this move could open up new options for institutions looking to work seamlessly across their fiat and cryptocurrency-denominated holdings.

⁸⁵ “Travel Rule Requirements Need Not Block Private Bitcoin Wallets”, Pawel Kuskowski, [Forbes](#), June 3, 2020.

⁸⁶ 12-Month Review of the Revised FATF Standards on Virtual Assets and Virtual Asset Service Providers”, [FATF](#), June 2020.

⁸⁷ Authority of a National Bank to Provide Cryptocurrency Custody Services for Customers”, [OCC](#), July 22, 2020.

In December 2020, the SEC issued a statement and a request for comment regarding the custody of digital asset securities by broker-dealers in order to encourage innovation. The statement set forth a five-year relief from enforcement actions for crypto custodians operating as broker-dealers subject to their business being limited to certain activities.⁸⁸ Leading law firms interpreted the rule as allowing for 'special purpose' broker-dealers that would be permitted to self-custody digital assets. In effect, the rule would apply to broker-dealers that exclusively deal in, effect transactions in, maintain custody of, and/or operate an alternative trading system for digital asset securities.⁸⁹ This rule thus gives many existing crypto businesses the room to continue to enhance and improve their platforms.

- **U.S. Office of the Comptroller of the Currency (OCC) Interpretive Letter on Banks Using Blockchain Networks for Payments:** In January 2021, the OCC published an interpretive letter indicating national banks and federal savings associations could participate as nodes in independent node verification networks (INVNs), otherwise known as blockchain networks and store or validate payments. The ruling also enabled the use of stablecoins, another form of crypto innovation that will be discussed in Section IV. Specifically, the OCC said INVNs “may be more resilient than other payment networks” due to the large number of nodes needed to verify transactions, which can, in turn, limit tampering.⁹⁰

The executive director of the Blockchain Association said in response to the ruling that “the letter states that blockchains have the same status as other global financial networks, such as SWIFT, ACH, and FedWire.”⁹¹ This too may raise the confidence level and allow for global banks based in the US to begin exploring ways to extend their participation.

While these developments do not represent a fully-formed regulatory response providing certainty to participants about the framework for building out the Bitcoin and cryptocurrency ecosystem, they do at least start to provide some assurance that regulatory bodies see the importance of the emerging landscape and are attempting to provide direction. Moreover, efforts to license its domestic businesses and bring them under the regulatory umbrella are happening in many key jurisdictions. Below are examples of some recent actions across the globe:

- The Monetary Authority of Singapore (MAS) implemented their Payment Services Act in 2020 requiring all Digital Payment Token (DPT) businesses to register. The Security and Futures Commission (SFC) in Hong Kong licensed its first brokerage and alternative trading system for digital assets in December 2020.⁹²

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⁸⁸ “Custody of Digital Asset Securities by Special Purpose Broker-Dealers”, [SEC](#).

⁸⁹ “Digital Asset Securities Custody: US SEC Issues Broker-Dealers Enforcement Relief and Requests Industry Comments”, [SIDLEY](#), December 28, 2020.

⁹⁰ “US Federal Regulator Says Banks Can Conduct Payments Using Stablecoins”, Nikhilesh De, [CoinDesk](#), January 4, 2021.

⁹¹ Ibid.

⁹² “Singapore Announces New AML Rules for Crypto Businesses”, Ian Allison, [CoinDesk](#), January 27, 2020.

⁹³ “OSL Receives License From Hong Kong Regulator, Becomes World's First SFC-Licensed, Listed, Insured & Big-4 Audited Digital Asset Trading Platform”, [PR Newswire](#), December 15, 2020.

- In 2020, Switzerland, seen by many as one of the progressive crypto business centers, passed a set of corporate and financial reforms known as the 'Blockchain Act' to regulate activities related to crypto and blockchain assets.⁹⁴ These reforms will be enacted in 2021 and will bring crypto and blockchain activities such as trading, clearing, settlement, and custody within the regulatory perimeter.
- In Germany, BaFin, the local regulator, added 'crypto-assets' as a new category of financial instruments, bringing such assets under the scope of existing regulatory framework and indicated those offering these instruments would need to register and be licensed by the regulator. They also formalized custody of crypto-assets as a regulated financial service requiring authorization and licensing.⁹⁵
- In the United Kingdom, the Financial Conduct Authority (FCA) indicated that any business conducting activities in regulated or unregulated tokens is subject to Anti Money Laundering and Counter Terrorist Financing (AML/CTF) regimes and is required to register with the FCA.⁹⁶

Understanding how much the Bitcoin ecosystem has evolved from a payments perspective, how it is now being utilized in a broadening set of retail services, how more investors are coming to view it as digital gold, and how the growing acceptance of Bitcoin inspires continued innovation such that it has become the North Star of an emerging on-chain commerce system all help to explain why institutional investors are becoming more interested in Bitcoin.

The maturation of the landscape from one that was originally geared to business-to-consumer (B2C) retail models of delivery to one that is morphing into a business-to-business (B2B) ecosystem providing the required services, controls, and products to enable broadening institutional participation is helping to expand the investor base. Two types of institutional investors are entering the market. Those looking to profit from market inefficiencies are helping to narrow the price volatility and provide more consistent liquidity and those with deep pockets that are bringing large sums of capital into the market, adding support to price dips as they build positions for a long-term strategies.

Regulatory moves are working to normalize and define the playing field for Bitcoin-related businesses and other crypto participants. Steps being taken are helping to build confidence, ensure consumer protections, and potentially draw more established participants into the landscape, further embedding Bitcoin into the financial ecosystem.

It is against this backdrop that we will now turn our attention to the drivers that have ignited the latest bull run-up in Bitcoin prices.

⁹⁴ "Switzerland Enshrines its Crypto-Friendly Policies Into Law", Adriana Hamacher, [Decrypt](#), September 10, 2020.

⁹⁵ "Guidance notice – guidelines concerning the statutory definition of crypto custody business (section 1 (1a) sentence 2 no. 6 of the German Banking Act (Kreditwesengesetz – KWG) Content", [BaFin](#), February 3, 2020.

⁹⁶ "Cryptoassets: AML / CTF regime", [FCA](#), October, 24, 2019.

“ The European regulator is active and engaged, which is providing investors the comfort of an institutional-grade asset. The U.S. regulators are slightly behind the curve with Asian regulators and clients the most mature related to exchange custody, and funding of the digital asset market.

– JAMES STICKLAND, ELWOOD ASSET MANAGEMENT

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“ The U.S. has lagged from a regulatory standpoint, but the problem with the U.S. is the amount of regulators. In Germany and Singapore, there is only one regular. In the U.S. you have the OCC, the Fed, CFTC, SEC etc.

– MICHAEL SHAULOV, FIREBLOCKS

”

“ Crypto is the only industry where the regulators have the same exact data as the companies they regulate.

– JONATHAN LEVIN, CHAINALYSIS

”

“ We are very engaged with regulators in the U.S. We have seen guidance from the SEC, CFTC, IRS, Treasury etc. There has been quite a bit of development and it's encouraging, but they are clear with what they want to see changed before they are ready to approve an ETF. They are looking for things like a domestic surveyable market, a market where manipulation — if it exists — can be detected and prosecuted, and surveillance sharing agreements.

– MICHAEL SONNENSHEIN, GRAYSCALE

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Section III

Investors Bet on Bitcoin's Potential as Digital Gold & the North Star of the Crypto Domain

As described in Section II, key elements of the infrastructure around digital assets have been maturing and new solutions are being launched at an accelerated pace, by startup companies as well as by incumbent financial institutions.

In parallel, the unprecedented macroeconomic conditions brought on by the COVID-19 crisis are feeding market expectations for a continued low interest rate environment and raising concerns about possible future inflationary pressures. Such expectations are driving investors to seek out potential sources of return that are uncorrelated to traditional financial markets.

Emerging views that Bitcoin is analogous to 'digital gold' take on increased importance against this backdrop, helping to feed mainstream institutional investors' initial forays into the space as they look to digital currencies as a portfolio diversifier and macro hedge.

Comments from legendary macro investor Paul Tudor Jones helped ignite such interest. Jones flagged Bitcoin as a potential inflation hedge early in 2020 "because of its finite supply", and indicated he was allocating 2% of his capital to Bitcoin.⁹⁷ He went on to announce in the fourth quarter of 2020 that Bitcoin was "the best inflation trade" because its value is insulated from inflation rates and more broadly, monetary policy.⁹⁸

Gains in the value of Bitcoin in turn are drawing attention to and encouraging adoption of other digital currencies and highlighting the experimentation with entirely new business models taking place in the on-chain domain. In this sense, Bitcoin is acting as the North Star to the emerging world of crypto commerce, helping to illuminate the financial industry's path.

Market Liquidity & Depth Shows Growing Level of Adoption

Section II described in detail the evolution of digital currencies exchanges from marketplaces designed primarily for retail audiences to venues aligned to institutional investor needs. As a growing number of institutional investors trade in Bitcoin and as crypto-focused exchanges and trade facilitators adopt functionality to support those investors' requirements, experts we interviewed noted improved levels of market liquidity and depth.

The ease with which large amounts of digital currencies can be traded without significantly impacting market price remains far from what's found in traditional securities markets. However, interviewees noted positive momentum that is helping to narrow the gap. Four factors are helping to drive such improvements:

⁹⁷ "Paul Tudor Jones Makes Bull Case for Bitcoin: 'The Path Forward From Here is North'", Julia La Roche, [Yahoo Finance](#), December 3, 2020.

⁹⁸ "Billionaire Investor Paul Tudor Jones Calls Bitcoin 'The Best Inflation Trade' as the Token Surges Above \$13,000", Ben Winck, [Business Insider](#), October 22, 2020.

- **Record Flows to OTC Trading Desks:** As noted in Section II, the maturation of over-the-counter (OTC) Bitcoin and crypto trading desks is providing institutional and high-net worth investors with new pathways to participate in the current bull market. The capacity to handle growing volumes is significantly better than in the prior 2017 market rally. OTC crypto desks have made extensive progress in upgrading their offerings from a rudimentary infrastructure that in some cases was based on inefficient communications such as Skype to electronic trading solutions with streaming, real-time, two-way pricing, or API interfaces.⁹⁹

Having this route to market is allowing institutional investors and high-net worth individuals to execute large block orders with minimal price slippage whereas the submission of such sizes to more retail-focused crypto exchanges might instead have resulted in potentially adverse market moves due to liquidity constraints in the past.

In early 2020, Bitcoin OTC trading volumes were already estimated to be around \$20 billion/day before the end-of-year rally really got underway.¹⁰⁰ By November 2020, leading OTC dealers reported they were experiencing record trade flows and “much more institutional buying than in 2017.”¹⁰¹

Crypto Quant analytics noted that even as Bitcoin prices experienced significant volatility in the beginning of 2021, the ratio of Bitcoin transfers involving all *exchanges* to all Bitcoin transfers *network-wide* had not gone up, “indicating that most transactions were being done through OTC deals, a preferred approach by institutional investors”.¹⁰²

- **Record Crypto Exchange Volumes:** Exchange volumes are also growing. Data from The Block showed record activity of more than \$500 billion in the first three weeks of January 2021 across the top 20 crypto exchanges, nearly double the record volume noted in 2017-2018.¹⁰³ Figure 12 shows that aside from the outlier spikes during the 2017-2018, volumes across the top seven crypto exchanges are all showing sustained increases in volumes. Experts we interviewed saw this as a proxy, albeit imperfect, for improved liquidity, which could also translate into lower slippage and more cost-effective trades.

⁹⁹ “OTC crypto market flourishes, powered by Skype”, Anna Irrera and Jemima Kelly, [Reuters](#), April 2, 2018.

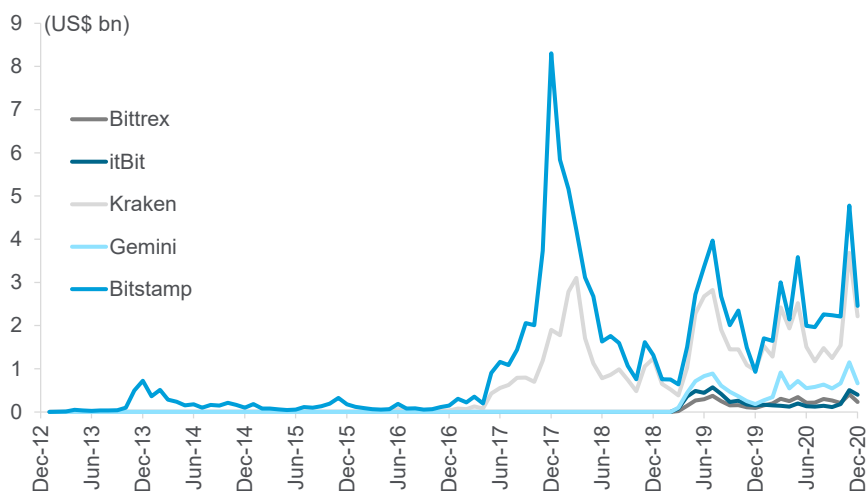
¹⁰⁰ “How Does a Bitcoin Over the Counter (OTC) Market Work? (Explained)”, Kiril, [Hacker Noon](#), March 11, 2020.

¹⁰¹ “Crypto’s Largest Over-the-Counter Trading Desks are Reporting Record Volumes”, Frank Chaparro, [The Block](#), November 30, 2020.

¹⁰² “Institutions Keep Buying Bitcoin’s Dip, Despite Near-Term Volatility: Data”, Muyao Shen, [CoinDesk](#), January 22, 2021.

¹⁰³ “Data”, [The Block](#), January 2020.

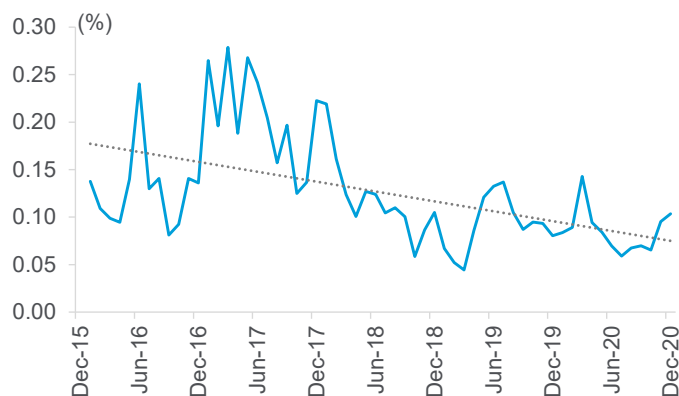
Figure 12. Monthly BTC-USD Volume for Some Key Crypto Exchanges



Source: Coin Metrics, Citi Business Advisory Services

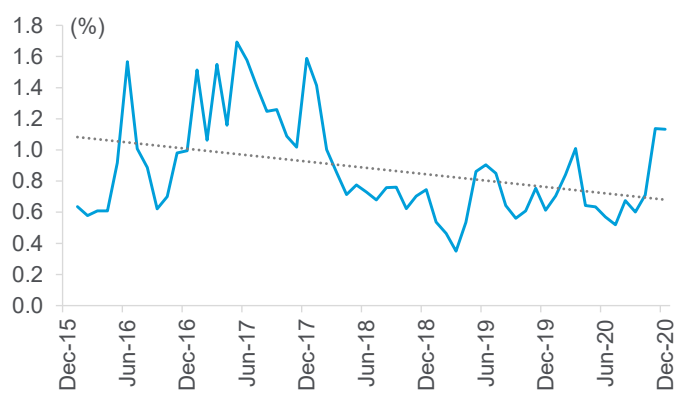
As shown in Figure 13, there has also been an overall narrowing of the bid/ask spread with the Bitcoin/USD pair showing spreads significantly below 2017-2018 levels across transaction sizes, whether looking at a 10 or 100 Bitcoin trade.

Figure 13. BTC/USD Spread for 10 BTC



Source: Coin Metrics, Citi Business Advisory Services

Figure 14. BTC/USD Spread for 100 BTC



Source: Coin Metrics, Citi Business Advisory Services

- **Better Trade & Risk Analytics:** Part of what is helping to drive narrowing spreads is a growing focus on 'best execution'. As noted in Section II, crypto exchanges have been building sophisticated 'pro' interfaces to facilitate more professional market participants. Newly emerging Bitcoin and crypto prime brokers are also offering sophisticated analytics and smart routing to ensure best execution. Emerging portfolio and risk trading platforms such as Omniex are building ways to perform these calculations.¹⁰⁴

¹⁰⁴ [Omniex](#), accessed December 2020.

In addition, they are developing functionality to allow for a broader range of trading algorithms to be deployed to aid in order execution. For example, Omniex is offering nine different types of algorithms (algos), ranging from fully passive 'pegger' algos designed to minimize slippage and market impact to 'iceberg' algos that divide a large order into smaller transactions so as not to influence the market to proprietary "spread" algorithms which execute when spreads are tightening.¹⁰⁵ Certain exchanges are increasingly white labelling such capabilities for a more competitive offering.

- **Growing Use of Access Products:** As discussed in Section II, the Grayscale Bitcoin Trust (GBTC), which passively tracks the price of Bitcoin, was the first publicly-quoted Bitcoin investment vehicle open to accredited investors and the first digital currency investment vehicle to attain the status of an SEC reporting company.¹⁰⁶ As noted earlier, the trust experienced extensive AUM growth in 2020.

Other access vehicles also attracted significant trading volumes. In Europe, the ETC Group, VanEck, and 21Shares have issued Bitcoin Exchange-Traded Notes (ETNs) on the Deutsche Börse.¹⁰⁷ The BTCetc Bitcoin Exchange Traded Crypto (BTCE) was launched in June 2020 to track the price of Bitcoin.¹⁰⁸ Each unit represents a claim on a preset amount of Bitcoin and, in addition to trading on Deutsche Börse's XETRA, it also trades on SIX Swiss Exchange.¹⁰⁹ Through mid-January 2021, it had reached an average daily trading of €57 million.¹¹⁰ SIX also has over 30 additional ETNs trading on its platform as of January 2021.¹¹¹

The premium required to access such products is decreasing as shown in Figure 15, possibly due to greater competition, which might lead to greater market efficiency.

¹⁰⁵ Ibid.

¹⁰⁶ [Grayscale Investments, LLC](#), 2020.

¹⁰⁷ "Bitcoin securities trading surges as investors seek crypto exposure", Steve Johnson, [The Financial Times](#), January 15, 2021.

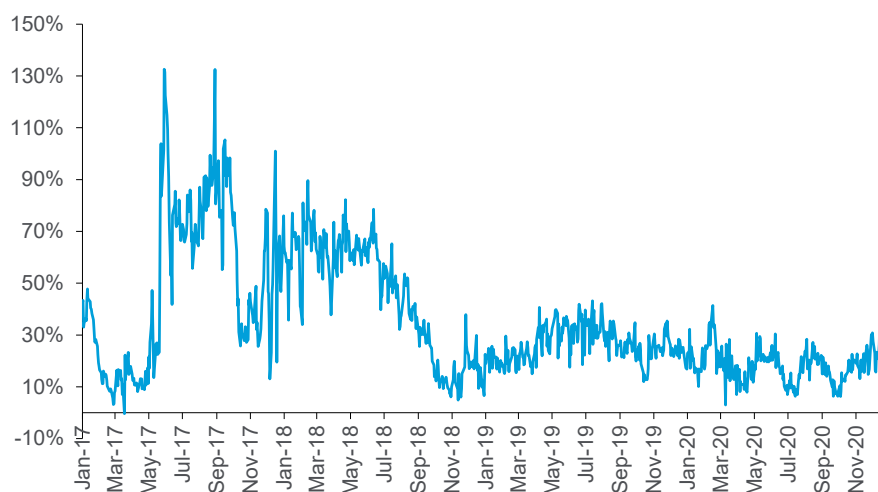
¹⁰⁸ "BTCetc Bitcoin Exchange Traded Crypto", [HANetf](#).

¹⁰⁹ Ibid.

¹¹⁰ "Bitcoin securities trading surges as investors seek crypto exposure", Steve Johnson, [The Financial Times](#), January 15, 2021.

¹¹¹ Ibid.

Figure 15. Grayscale Bitcoin Trust Premium (GBTC)



Source: Bloomberg, Citi Business Advisory Services

Underlying the rise in institutional and high net worth investor participation is a view that Bitcoin's value proposition as a new type of 'digital gold' fills a niche for both risk assets and inflation hedges in an investment landscape remade by the COVID-19 pandemic.

“ I think there are still gaps that are not always clear around the execution side facing the exchanges. Cross margining is still a gap and there are different approaches to that gap. There are transparent ways that aren't capital efficient and ways that are capital efficient that bring about counterparty risk. In the traditional market, a venue like NASDAQ doesn't have a DTC offering, and they have to go through broker dealers. However, some crypto exchanges have 50%+ of their revenue coming from consumers so the traits that work for the old pipes don't work for this since the mechanics are different.

– MICHAEL SHAULOV, FIREBLOCKS

“ The market is evolving and there is rapid convergence between firms like OSL, and traditional prime brokers.

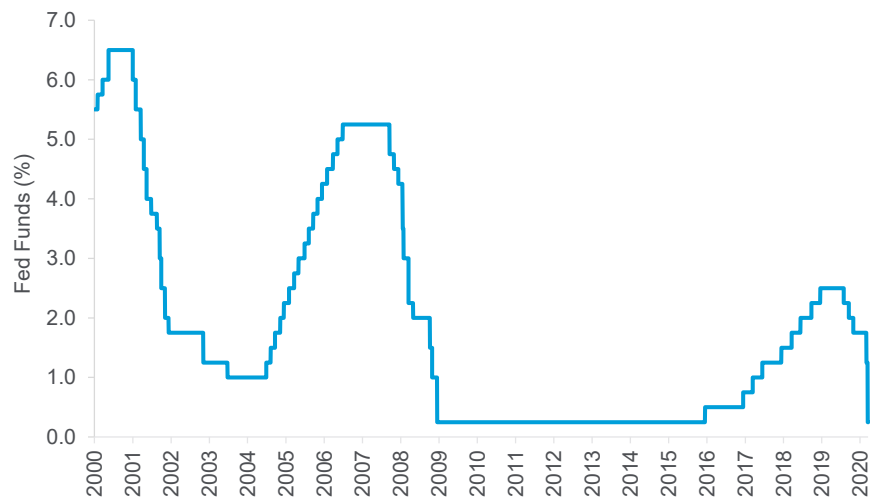
– MATT LONG, OSL

Macro Trading Environment Drives Institutional View of Bitcoin as Safe Haven and Inflation Hedge

The COVID-19 crisis has put the world into uncharted territory. The simultaneous supply and demand shock presented an unprecedented challenge to financial markets and left market participants surprised at the speed and extent of government intervention.

Monetary and fiscal responses to the crisis occurred more quickly and were considerably larger than in the 2008 Global Financial Crisis ("GFC"), reflecting both lessons learned and the scale and scope of the pandemic's effects. In a single 2020 weekend, the U.S. Federal Reserve deployed most of the measures it had rolled out over 16 months in the GFC (from late 2007 to early 2009) as shown in Figure 16.

Figure 16. U.S. Policy Rate Cycle (2000-2020)



Source: Bloomberg, Citi Business Advisory Services

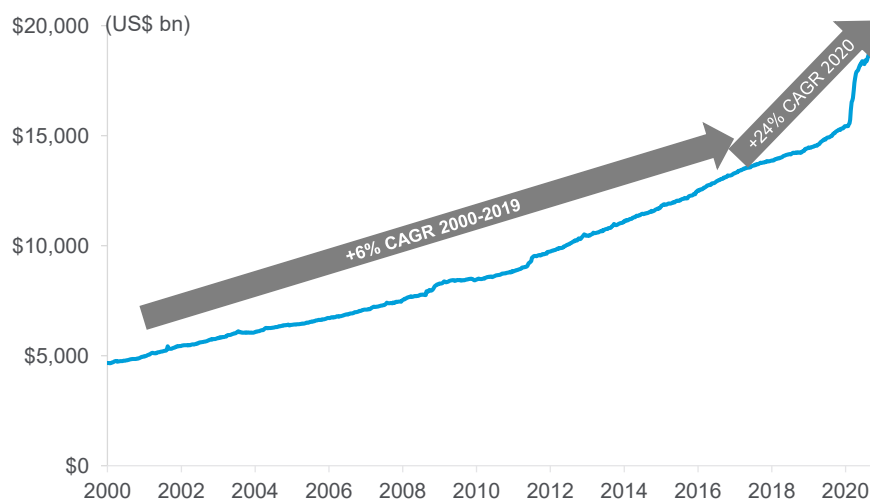
Such monetary policy responses were widespread around the world. G7 central banks bought \$1.4 trillion of financial assets in March 2020, nearly five times the previous monthly record set in April 2009.¹¹² Governments also put together fiscal packages, such as the \$2 trillion CARES Act in the U.S., which were substantially larger than in 2008 and which were announced considerably sooner.¹¹³

While market participants initially questioned whether sovereigns would be able to sustain such unparalleled monetary and fiscal measures, over the course of 2020, the sense amplified that central banks and governments would continue their coordinated, wide-reaching measures to prop up ailing economies and prevent spillovers into financial markets. Expansionary monetary policies are therefore expected to continue. As shown in Figure 17, the U.S. money supply increased by almost a quarter in just one year in 2020, after previously having taken nearly twenty years to double in size.

¹¹² "The Fed Is Buying \$41 Billion of Assets Daily and It's Not Alone", Matthew Boesler and Yuko Takeo, [Bloomberg](#), April 21, 2020.

¹¹³ "The Treasury Department is Delivering COVID-19 Relief for All Americans", [U.S. Department of the Treasury](#).

Figure 17. Growth in U.S. Money Supply



Source: Board of Governors of the Federal Reserve System (U.S.) M2 Money Stock, Retrieved from FRED January 22, 2021.

The magnitude and global nature of government intervention has also laid the foundation for the current zero-rate environment to persist. In Europe, the European Central Bank's Pandemic Emergency Purchase Program (PEPP) has provided over \$1.85 trillion in economic stimulus and is scheduled to continue at least through March 2022.¹¹⁴ The three official rates — refinancing operations, marginal lending facility, and deposit facility, were set at 0 basis points (bps), 25bps, and -50bps as of January 2021.¹¹⁵

Loose monetary policies and aggressive stimulus programs have accentuated longer-term inflationary expectations, offsetting immediate deflationary pressures stemming from repeated lockdowns and persistent unemployment. This has left many institutional investors with two challenges — what to do in order to find yield and deploy risk capital and how to hedge inflation.

Institutional Investor Challenges

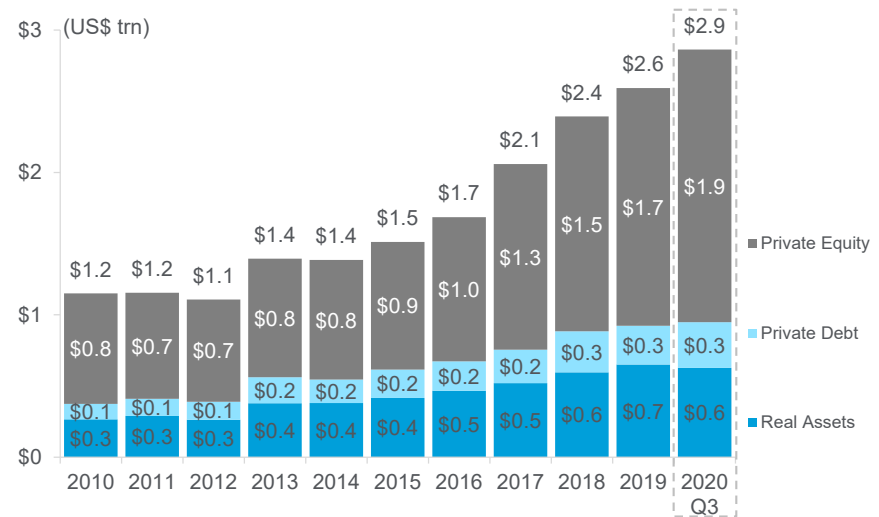
Against record low interest rates, sometimes trending into negative territory, a growing number of institutional investors have either begun or hastened their search for yield. Public equity and bond markets are seen as closely tied to government actions and are expected to be underpinned and stabilized by intervention in order to support local economies. Views are these offerings will as a result, be less risky investments than usual until such government underpinning is withdrawn.

This opens up potential to deploy risk capital elsewhere, but the main destination for increased allocations — the private investment markets — is having trouble deploying new capital. The rotation out of public and into private equity has been going on for some time. Indeed, so much capital has moved into the private equity, credit, and real asset markets that the amount of dry powder (committed, but as of yet, uncalled capital) was projected to be nearly \$3.0 trillion by the end of 2020, an amount equal to the size of the entire private market in 2011, as shown in Figure 18.

¹¹⁴ "ECB expands and extends its bond buying as coronavirus resurgence weighs on the recovery", Elliot Smith, [CNBC](#), December 10, 2020.

¹¹⁵ Key ECB Interest Rates, [ECB](#), accessed January 2021.

Figure 18. Private Capital Dry Powder



Source: Preqin, Citi Business Advisory Services

The looming threat of a medium- to longer-term inflation has also prompted investors to look for options to protect their portfolios against such pressures. Traditionally, capital moves into commodities in such situations and 2020 proved no different. Increased interest in gold, copper, and silver helped propel those market returns higher, rising approximately +25%, +26%, and +48%, respectively in 2020.¹¹⁶ Such significant run-ups in the usual instruments targeted for inflation hedging have made entry points to extend coverage more challenging.

Increased Focus on Bitcoin

The argument heard from our expert interviewees can thus be summed up as follows: there may be relatively lower than normal risk in public markets due to government support, which in turn frees up investors to deploy more risk capital; the ability to allocate expanded amounts of risk capital to private markets is constrained by already high reserves of dry powder; and against this backdrop, there is a growing need to hedge inflation, but traditional inflation hedges are already well established and valuations are high. The combination of these perceptions is thus prompting many investors to look further afield to find opportunities.

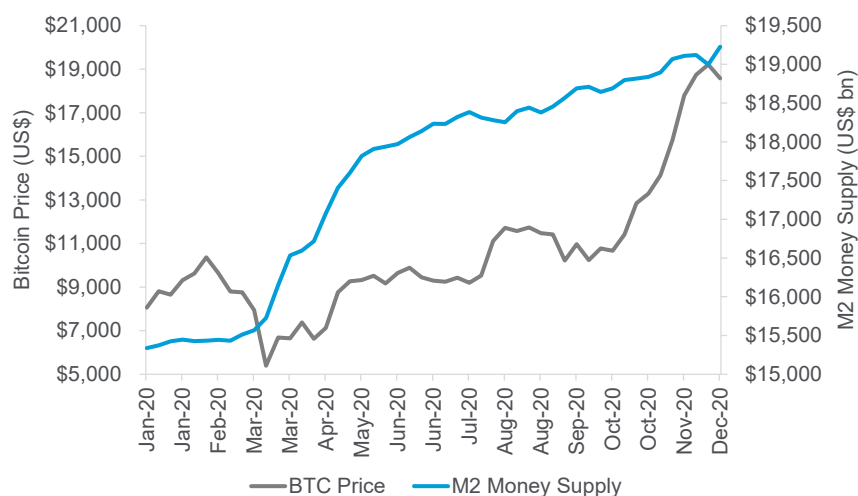
This is where the emerging views of Bitcoin as a potential source of 'digital gold' due to its finite supply of 21 million coins become so important.¹¹⁷ Just as precious metals like gold are seen as scarce in the physical world, Bitcoin's digital scarcity is seen as offering a potentially equivalent value proposition.

Many interviewees hypothesize that the finite availability of Bitcoin stands in stark contrast to elastic sovereign money supplies and governmental incentives to print money to cover ballooning public debts. Bitcoin prices rose sharply as the US money supply jumped as shown in Figure 19.

¹¹⁶ "The periodic Table of Commodity Returns (2021 Edition)", Dorothy Neufield, [Business Insider](#), January 8, 2021.

¹¹⁷ "Total Circulating Bitcoin", [Blockchain.com](#).

Figure 19. Bitcoin Price vs. Growth in U.S. Money Supply



Source: Board of Governors of the Federal Reserve System (U.S.) M2 Money Stock

Moreover, if the analogy of Bitcoin as 'digital gold' holds true, there is an argument to be made that the market capitalization of Bitcoin may begin to approach the market capitalization of gold at some future point, presenting a potential value trade. For comparison, the market capitalization of Bitcoin hit \$1 trillion on February 19, 2021¹¹⁸ whereas gold's market capitalization was approximately \$10 trillion.¹¹⁹

To build out the Bitcoin to gold comparison further, consider the following:

- Crypto industry research from NYDIG notes Bitcoin's supply growth is seen to be approaching +1.3% annually in late 2020, approximately the same annual rate of increase occurring in the global supply of gold.¹²⁰ Unlike gold, however, Bitcoin's rate of supply growth is driving toward +0.0% on a projectable time table.
- Research from NYDIG also explored the amount spent annually on capital expenditures by the ten largest public gold miners and the amount spent on capital expenditures by Bitcoin miners, with the latter expending significantly less (about 44%) of what gold mining companies spend.¹²¹
- Some market participants further highlight the possible benefits of Bitcoin relative to physical gold, including easier divisibility, virtual storage, independence from government intervention, and even its viral appeal to Millennial consumers and investors.¹²² They conclude that in effect Bitcoin "blends the benefits of technology and gold".¹²³

¹¹⁸ "Bitcoin \$1 trillion market value as cryptocurrency surge continues, Jesse Pound, [CNBC](#), February 19 2021.

¹¹⁹ "Bitcoin's Market Cap Could Hit \$1 Trillion in 2021 as its Growing Reserve Currency Status Drives Adoption Higher, A Cryptocurrency Expert Says", Shalini Nagarajan, [Business Insider](#), December 19, 2020.

¹²⁰ "Total Circulating Bitcoin", [Blockchain.com](#).

¹²¹ "The Power of Bitcoin's Network Effect", Greg Cipolaro and Ross Stevens, Ph.D., [NYDIG](#), November 27, 2020.

¹²² "Bitcoin: a symptom of market mania — or the new gold?", Merryn Somerset Webb, [The Financial Times](#), January 8, 2021.

¹²³ Ibid.

The intersection of low yields and inflationary expectations has increasingly fostered the view that Bitcoin could represent at once an inflation hedge, a portfolio diversifier, and a safe haven as traditional government bonds no longer offered that feature in 2020.

“ Bitcoin is a store of value that imparts freedom and control unto the holders for a variety of reasons unique to them.

– THOMAS CHIPPAS, ERISX

”

“ Institutions are interested in crypto this year. The central banks printing trillions had a profound impact on portfolio holdings. If bond yields are already negative, it's hard to maintain a balanced portfolio where equities and bonds are sufficiently negatively correlated. Portfolio holdings are riskier than ever before.

– BEN RIN, ELWOOD ASSET MANAGEMENT

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“ Gold has metallurgical properties that I find fascinating, and I understand why humans gravitate to gold as a store of value. But as people worry about inflation and buy gold they don't think about its metallurgical properties. They think about its brand. In the same way people will buy Bitcoin or Ethereum without thinking about the underlying cryptography.

– ITAY TUCHMAN, GLOBAL HEAD OF FX, CITI

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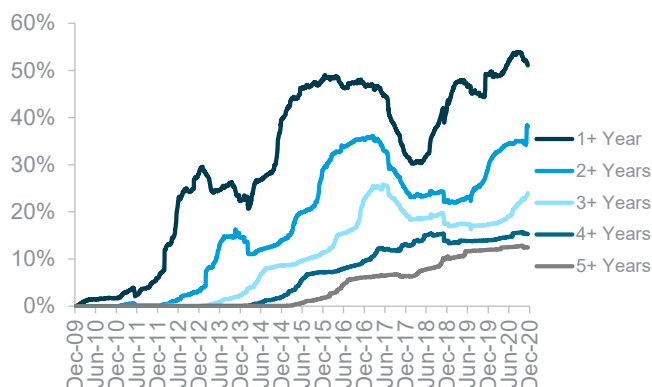
Institutional Interest in Bitcoin Accelerates

While Bitcoin traded as an almost exclusively retail asset class pre-2017, institutional money began to flow into Bitcoin starting in 2017 as the price of cryptocurrencies sustained a remarkable bull run. Most of this money traced back to newly-founded crypto hedge funds, as well as to a number of venture capital funds. For example, venture firm Andreessen Horowitz launched its first dedicated crypto fund with \$300 million in capital commitments from a subset of its limited partners in 2018 and followed up with a second fund with over \$500 million in capital in 2020.¹²⁴ A select number of university endowments, including Yale and Harvard, reportedly also allocated capital to the space.^{125,126,127}

Our expert interviewees saw 2020 as a tipping point for mainstream institutional investors entering digital currencies markets, with Bitcoin leading the way. A number of metrics are often cited as important proof points for this transition. First, as discussed in Section II, open interest in CME's Bitcoin futures, often considered a benchmark of institutional activity due to the fact that futures provide exposure to Bitcoin without having to hold it directly and in large trade sizes, had surged by over +250% between October 2020 and January 2021.¹²⁸

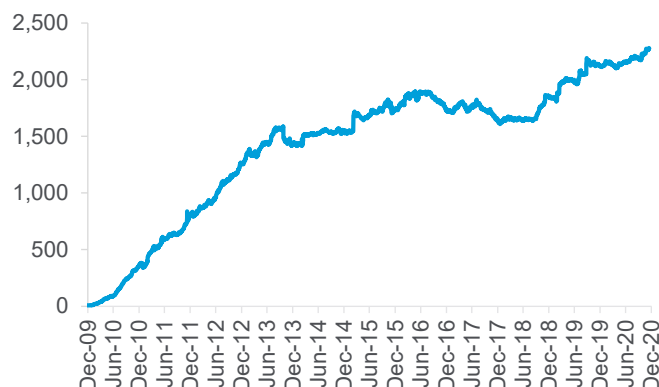
Second, the holding period for Bitcoin has also experienced a significant increase, reinforcing the view that Bitcoin is no longer seen simply as a short-term speculative play but rather as a long-term portfolio diversification tool and macro hedge. Figure 20 illustrates that the percentage of Bitcoin not switching hands has increased across periods of one to five years, ranging from over 50% for a holding period of at least one year to over 10% of Bitcoin being held for five years or longer.

Figure 20. Percent of Bitcoin Held Over Time



Source: Coin Metrics, Citi Business Advisory Services

Figure 21. Number of Addresses Holding 1,000+ Bitcoin



Source: Coin Metrics, Citi Business Advisory Services

¹²⁴ "Andreessen Horowitz just closed its second crypto fund", Connie Loizos, [TechCrunch](#), April 30, 2020.

¹²⁵ "Yale Invests in Crypto Fund That Raised \$400 Million", Alastair Marsh and Lily Katz, [Bloomberg](#), October 5, 2018.

¹²⁶ "Harvard Invests Millions in New Cryptocurrency", Luke W. Vrotsos and Cindy H. Zhang, [The Harvard Crimson](#), April 12, 2019.

¹²⁷ "Harvard Takes the Plunge Into Crypto With a Token Sale Investment", Michael McDonald and Alastair Marsh, [Bloomberg](#), April 11, 2019.

¹²⁸ "Bitcoin Will Break Wall Street's Heart", Mike Bird, [The Wall Street Journal](#), January 13, 2021.

The fact that more Bitcoin blockchain addresses are holding a large number of coins (1,000 or more), as shown in Figure 21, supports this idea. While this phenomenon could also be attributed to Bitcoin market participants outside of mainstream institutions — the Bitcoin 'whales' — our interviewees view it as partially indicative of greater investment from established investors. More demand from institutional participants is anticipated.

■ **Fidelity Digital Assets Study:** A survey published in June 2020 by Fidelity Digital Assets in collaboration with Greenwich Associates across 800 U.S. and European investors consisting of family offices, endowments and foundations, financial advisors, crypto hedge funds, venture funds, and high-net worth individuals explored their rationale for investing in digital assets.¹²⁹ The top five reasons related to their view that digital assets were: (1) uncorrelated to other assets (36% of respondents); (2) an innovative technology play (34% of respondents); (3) having high potential upside (33% of respondents); (4) a conduit to decentralization (22% of respondents); and (5) free from government intervention (17% of respondents).¹³⁰

Bitcoin was cited as the “digital asset of choice with both traditional investors and crypto funds”, with 26% of those surveyed indicating they had exposure to Bitcoin and only 11% to Ether, the token associated with the Ethereum network.¹³¹ 58% of investors in the survey were cited as having a positive or neutral perception towards digital assets in 2020, up from 43% in 2019, and over 80% expressed interest in institutional investment products holding digital assets.¹³²

■ **Bitwise Asset Management Study:** A similar study conducted in late 2020 by Bitwise Asset Management, a pre-eminent provider of crypto-focused index funds, tells a similar story.¹³³ It found that the primary reason why advisors were interested in Bitcoin was related to its ability to produce uncorrelated returns, and it noted a significant increase in those interested in Bitcoin as an inflation hedge — 25% of advisors viewed this as a beneficial characteristic of crypto currencies, up from 9% in 2019.¹³⁴

The study found that the percentage of advisors allocating to cryptocurrencies in 2020 had risen to 9.4% from 6.3% in 2019.¹³⁵ Moreover, almost 20% of advisors surveyed were contemplating making an allocation in 2021.¹³⁶

While large institutional asset owners such as pension funds or sovereign wealth funds continue to cite the regulatory and reputational risk around Bitcoin, as well as its often extreme price volatility, as significant hurdles in allocating capital to this emerging asset class, a growing subset of institutional investors, comprising primarily of family offices, endowments and foundations, and hedge funds, and even asset managers more recently, are dipping into this burgeoning market.

¹²⁹ “Institutional Investors Digital Asset Survey”, Ria Bhutoria, [Fidelity Investments](#), June 2020.

¹³⁰ Ibid.

¹³¹ Ibid.

¹³² Ibid.

¹³³ “Bitwise/ETF Trends Release Results Of 2021 Survey Of Financial Advisor Attitudes Toward Crypto”, [Bitwise Asset Management](#), January 12, 2021.

¹³⁴ Ibid.

¹³⁵ Ibid.

¹³⁶ Ibid.

This trend is evidenced by the world's largest asset manager, BlackRock, filing with the SEC to trade Bitcoin futures in two of its funds in early 2021.¹³⁷

Sentiments such as those expressed by billionaire investor Bill Miller of Miller Value Partners in an investor letter dated January 21, 2021 may draw even more traditional investors into the Bitcoin domain. He writes that "almost every long-term holder of Bitcoin has earned a higher rate of return in Bitcoin than in anything else, and those that understand it see little reason to put their excess marginal liquidity into other assets at this point. The world is ruled by fat tail events, or seemingly improbable occurrences that have an outsized impact, and all indicators so far point to Bitcoin as being one."¹³⁸

“ The question is no longer why, but when will major financial firms begin to each strategically offer investors the ability to trade crypto as a supported asset class, as well as digital versions of traditional assets like stocks and bonds on a shared public blockchain.

– ITAY MALINGER, CURV

”

“ We saw last year that institutions were already entering the market, just without a lot of fanfare.

– THOMAS CHIPPAS, ERISX

”

“ Our investors have a variety of investment mandates. There is a preconceived notion that digital assets are a momentum trade or are only for tech investors, but we also have investors from global macro funds, risk arb funds, value funds, etc. It's not just for any one kind of investor, but it's also not for everyone. It is risky and it's an early stage investment, and you should have a medium- to long-term investment horizon.

– MICHAEL SONNENSHEIN, GRAYSCALE

”

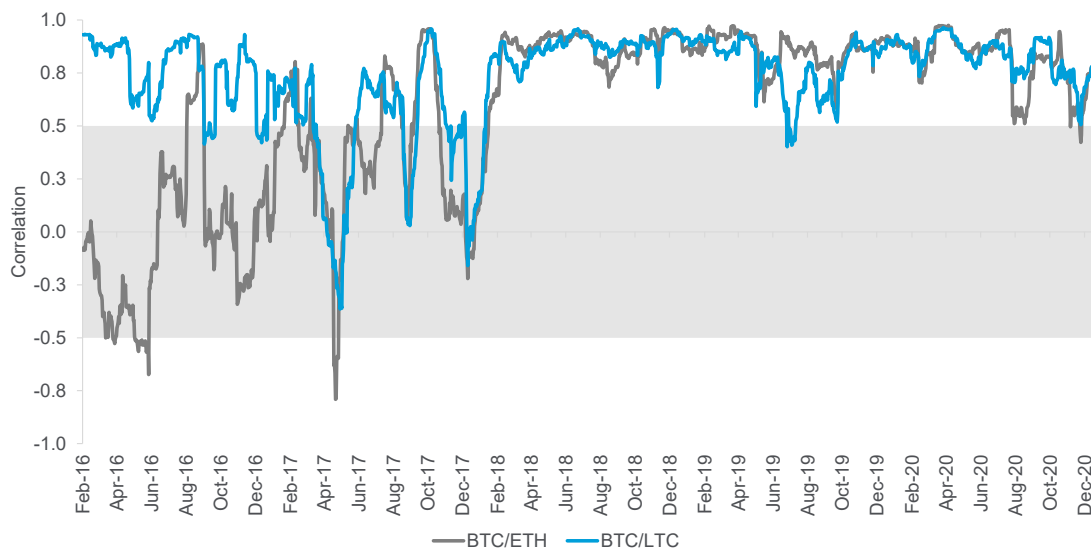
¹³⁷ “BlackRock has joined the bitcoin business - the world's largest asset manager has said two of its funds can now invest in the cryptocurrency”, Shalini Nagarajan, [Business Insider](#), January 21, 2021.

¹³⁸ “Value Investor Bill Miller Buys MicroStrategy Debt for the Bitcoin”, Jeff Benson, [Decrypt](#), January 24, 2021.

Bitcoin's Success Drives Spillover Benefits for Broader Crypto Ecosystem

Excitement around Bitcoin is also driving interest and investment into other digital currencies. To some extent, this is because there is a correlation between these assets. Looking specifically at two of the largest Bitcoin alternatives, Ether and Litecoin, our analysis of rolling 30-day return correlations over the period January 2016 to mid-December 2020 shows the Bitcoin/Ether pair correlation at 0.54 and the Bitcoin/Litecoin pair correlation at 0.63. Figure 22 shows how those correlations have progressed over time and have hovered well above 50% in the last two-year period.

Figure 22. Correlation with Bitcoin and Ether and Litecoin



Source: Coin Metrics, Citi Business Advisory Services

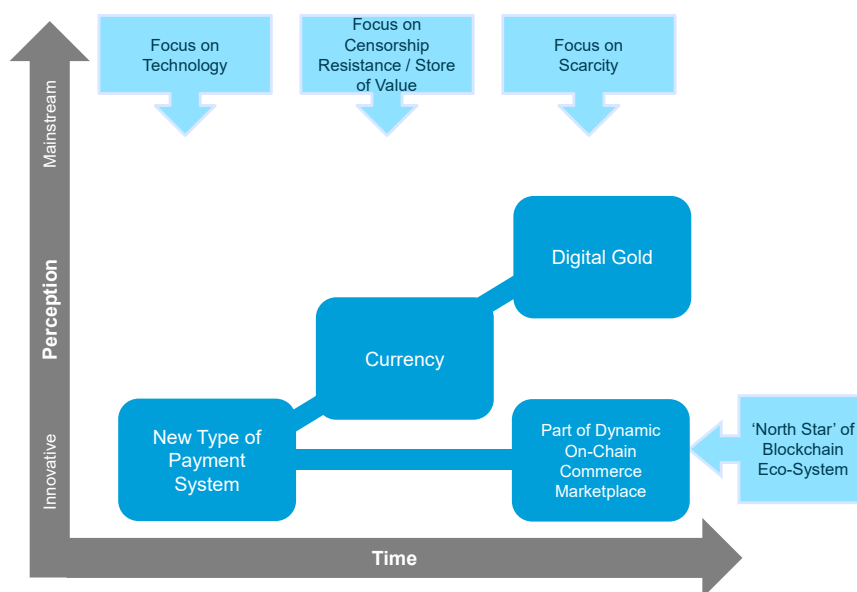
The relationship between Bitcoin, these altcoins, and the broader crypto ecosystem is about more than just the measurement of their correlation, however. As the first, most well-capitalized and most broadly-owned cryptocurrency, Bitcoin is also seen as a barometer of how attention is being focused on the broader crypto ecosystem.

The success of Bitcoin helps validate the innovativeness of the technology and the decentralized approach. This inspires additional innovation and even newer business models. As those models succeed, more positive attention is given to Bitcoin. Bitcoin is thus playing a key role in encouraging experimentation with completely new use cases in digital assets, leading to the creation of an entirely new on-chain model of commerce.

Bitcoin as the 'North Star' of the Digital Asset Space

This tendency of other altcoins to follow in Bitcoin's wake underscores a growing view heard in our interviews that Bitcoin is becoming the de facto 'North Star' of the digital asset space, with its trajectory being seen as a compass for the evolution of the broader ecosystem. This is illustrated in Figure 23, which completes our conceptualization of Bitcoin's evolution from a payments system to a currency to digital gold. In parallel, Bitcoin has become the foundation for the development of on-chain, decentralized marketplaces and networks.

Figure 23. What is Bitcoin? Part 3



Source: Citi Research

Traditional finance happens within a centralized model, built on centrally-managed infrastructure with trade flows facilitated by trusted intermediaries. The emergence and growth of the Bitcoin blockchain marks a seminal shift from that approach.

The decentralized nature of the new system opens up new thinking about how to re-engineer financial marketplaces. Bitcoin's success spurred the creation of other distributed ledger protocols extending the view of what digital assets might become. The most significant new entrant to date being the Ethereum protocol, first released in 2015.¹³⁹

Whereas the Bitcoin protocol has largely enabled creation of Bitcoins, the Ethereum protocol is premised on the development of 'smart contracts'. These contracts are templates that can be programmed to provide any number of products or services based on a coded set of predefined rules and conditions.

The code lays out specific data triggers to initiate action, describes exactly what actions will take place, and defines the data inputs that would affirm that the transaction has been completed. Algorithms monitor for and provide the data inputs to the contracts required to begin and end transactions, scanning real-world APIs, databases, and on-chain activities. Entire transactions can be initiated, confirmed, and completed without any human intervention or third party intermediation.

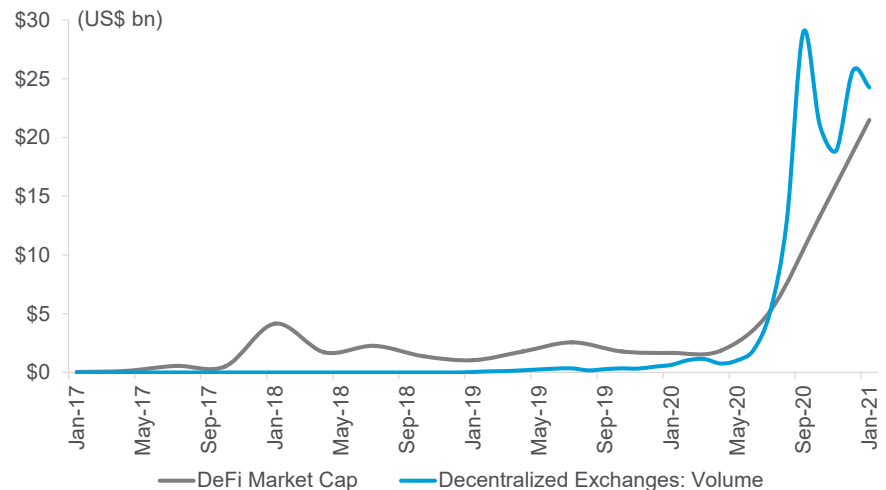
This transforms the nature of commerce. An explosion of new smart contract-driven, decentralized applications ("Dapps") is bringing a growing number of individuals and organizations into the on-chain ecosystem. These Dapps range from entertainment-driven (games, gambling) to facilitative (identity verification, cross-chain transactions) to financial. Indeed, they have made possible a whole new branch of decentralized, distributed, peer-to-peer trade, and financial offerings where parties can transact directly with each other, bypassing traditional participants.

¹³⁹ "Blockchain: A Very Short History Of Ethereum Everyone Should Read", Bernard Marr, [Forbes](#), February 2, 2018.

Decentralized finance (“DeFi”), also known as the Open Finance movement, is driving significant activity.¹⁴⁰ These services span a broad set of financial functions — some of which we have highlighted already like lending, borrowing, trading, or exchanges, but others of which include tokenized asset swaps, savings pools, and prediction markets.^{141 142}

While DeFi is relatively new and the value of cumulative activities remains less than 5% of the overall market capitalization for digital currencies, the space experienced dramatic growth in 2020, which is shown in Figure 24.¹⁴³

Figure 24. Growth in DeFi Activity and in the Volume of Decentralized Exchanges



Source: Dune Analytics, Coin Gecko

Notably, the volume traded on decentralized exchanges has grown at a similar pace. A decentralized exchange (DEX) is one type of Dapp that algorithmically connect buyers and sellers based on their submitted orders. Users submit orders from their own wallets using their private keys and when a buyer and a seller are matched, the transaction is recorded, but has to go through a public node verification process before being added to the blockchain. There is no third-party exchange entity sitting in the middle to facilitate the transaction and move the coins on the user’s behalf. Showing a willingness to arrange their own cryptocurrency trades is thus seen as a proxy for an individual being willing to perform more extensive peer-to-peer activities.

Interestingly, trading volumes on Uniswap, one of the main decentralized exchanges, surpassed those on a major global crypto exchange in September 2020.

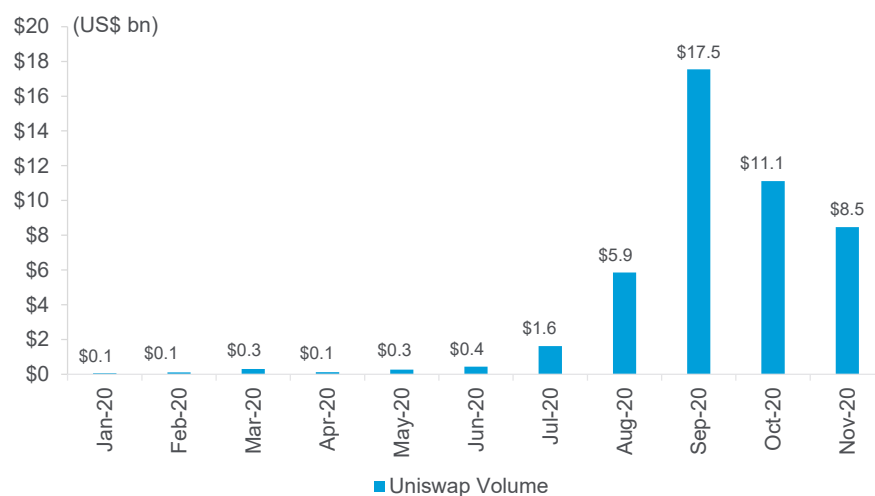
¹⁴⁰ “The Ultimate Beginner’s Guide to Decentralized Finance (DeFi)”, Robert Stevens, [Decrypt](#), January 20, 2021.

¹⁴¹ Ibid.

¹⁴² Blockchain for Decentralized Finance (DeFi)”, [ConsenSys](#), 2021.

¹⁴³ DeFi Exchange Volume, [Dune Analytics](#), January 22, 2021; DeFi Market Cap, [Coin Gecko](#), January 21, 2021.

Figure 25. Uniswap Transaction Volumes



Source: Uniswap, Citi Business Advisory Services

While decentralized finance is built on Ethereum, alternative building blocks based on Bitcoin are beginning to emerge such as via wrapped Bitcoin, which represents Bitcoin as a token on the Ethereum network with a one-to-one exchange rate. Wrapped Bitcoin has been developed so as to allow Bitcoin holders to participate in decentralized finance more easily.¹⁴⁴

As the success of Bitcoin rallies interest and capital for other digital currencies as well as for entirely new, distributed trade and financial systems, a flywheel emerges, whereby developments in altcoins and decentralized finance reinforce the growing adoption of Bitcoin, and the expanding success of Bitcoin continues to draw more talent and experimentation into the distributed trade and financial systems.

Having explored the emergence, maturation, and growing use of Bitcoin in payments, trade, and investment portfolios, Section IV will now explore how Bitcoin may evolve into the future and what repercussions that may have on the legacy financial infrastructure.

“ While everyone likes to predict prices for Bitcoin and compare it to gold, there are other growing areas that should not be overlooked. For example, while DeFi currently accounts for less than 5% of the total crypto market cap, its adoption and explosive growth suggest that trading volume in DeFi will surpass those of many traditional assets.

– ITAY MALINGER, CURV

”

¹⁴⁴ “What is Wrapped Bitcoin”, [Coinmarketcap.com](https://coinmarketcap.com), September 15, 2020.

“

We may see more traditional assets trade on Uniswap. There is one tokenized real estate token trading on Uniswap, RealT, that includes securities compliance and Know-Your-Customer compliance technologically at the token level. I wouldn't be surprised if more traditional institutions follow that lead. Because the Uniswap protocol is permission-less, institutions of different types and in different geographies can onboard off-chain assets of their choice.

– MATTEO LIEBOWITZ, UNISWAP

”

Section IV

Mapping the Future: Bitcoin May Benefit from Broadening Use of Blockchain Technologies

Bitcoin's development is happening across multiple fronts. It is increasingly being used as a payment option as noted in Section II. It is finding investor interest due to its digital scarcity and is being explored as a new type of digital gold. And, as noted in Section III, it is also acting as the inspiration and North Star for an entire emerging crypto ecosystem.

Bitcoin's future, however, may wrap back around to its earliest roots. Though the perception of Bitcoin is broadening, it will always be inextricably linked with the introduction of blockchain. As noted in Section I, the original intent of Bitcoin's creator was to provide a new type of payment system that combined cryptographic tools and a distributed ledger.

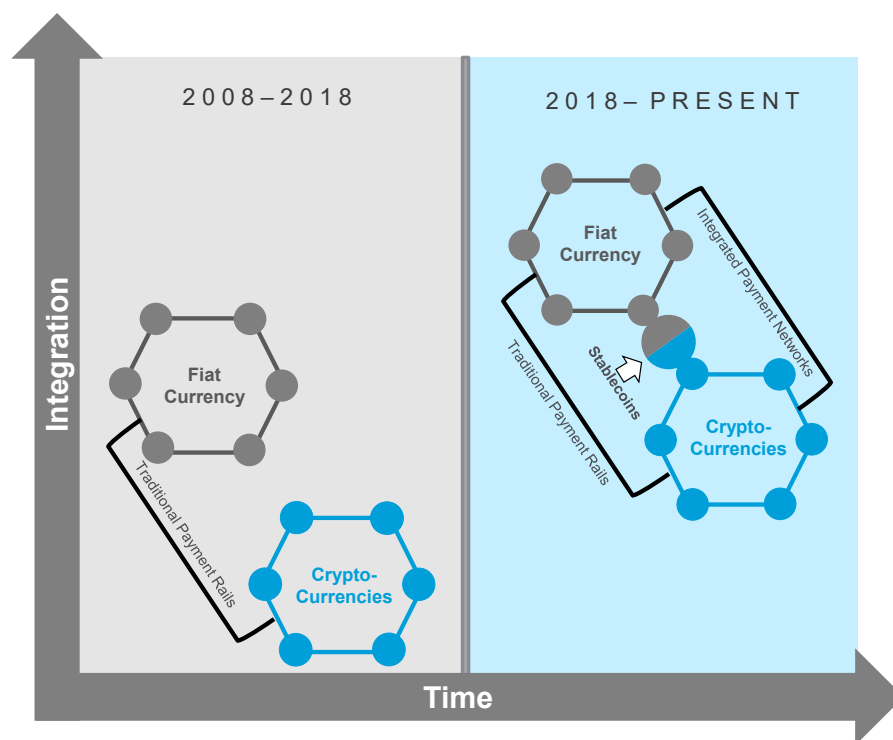
This point is critical because a growing set of use cases are emerging that look beyond cryptocurrencies. These efforts are leveraging blockchain in new ways. Such efforts are working to validate blockchain and bring it into the mainstream. New innovations are providing a growing set of on and off ramps between the fiat and crypto ecosystems, allowing for the emergence of a new hybrid operating model.

As this gradual joining of the two systems occurs, there is an increased chance Bitcoin's role in that future economy may expand once more, becoming potentially the currency used to facilitate global trade.

Moving from Traditional Payment Rails to Payment Networks

As shown in Figure 26, when Bitcoin and other cryptocurrencies were initially developed, these blockchain-based networks were operating independently of the fiat currency system. Traditional payment rails were used to transfer fiat currencies into and out of the cryptocurrency world.

Figure 26. Evolution of Payments Ecosystem



Source: Citi Business Advisory Services

Transfers were enabled by either transferring money from a bank account via wire or national payment systems such as automated clearing house (ACH); or by linking a credit card or a debit account to a digital wallet provider or centralized exchange. Each movement of fiat currency into and out of the cryptocurrency ecosystem was triggered by a distinct user request. Gradually, payment networks that would automate the exchange of payments between the fiat and crypto world began to emerge.

As noted in Section II, PayPal's decision to add Bitcoin to their platform in 2020 is an example of this evolution. A user on the PayPal network can now use Bitcoin to make a payment to any of the 345 million users in the PayPal network and PayPal will automate all of the exchanges needed to occur in the background to ensure that the merchant is able to receive payment in fiat currency.¹⁴⁵ All the user needs to do is choose to pay in Bitcoin, and PayPal will handle the rest of the transaction. This is a marked improvement in the ability of money to move between the two ecosystems.

Fiat Currency Stablecoins Create More Interoperability between Ecosystems

Moving currency between the fiat and crypto networks was the first step toward integration, but the volume of cross-network activity was constrained. Commercial banks were unwilling to open accounts for merchants engaged in Bitcoin and cryptocurrency backed businesses, including cryptocurrency exchanges. This created limitations on storing, moving, transacting, and exchanging these coins.

¹⁴⁵ "Bitcoin Is Good for PayPal, but Is PayPal Good for Bitcoin?", Ajit Tripathi, [Yahoo](#), November 4, 2020.

Most organizations facilitating cross-network currency movements imposed limits on the amount of fiat currency that could be transferred or the amount of cryptocurrency that could be spent in order to manage such risk. For example, PayPal will only allow cryptocurrency transactions equating to \$20,000 or less per week on its network whether focused on one or across many cryptocurrencies.¹⁴⁶

While a limit of this magnitude might suffice for an individual looking to move payments, a figure this low might severely limit the ability of a merchant to use cryptocurrencies to pay for goods, services, or payroll in the fiat currency world. Unchecked, this situation might inhibit growth in the cryptocurrency commerce marketplaces described in Section III.

Moreover, individuals who want to hold fiat currencies in their digital wallets might be subject to potentially extreme fluctuations in the value of those assets, not only because of the potential for cryptocurrencies to move significantly in value, but also due to the potential of upheaval or economic distress in their domestic currency in which case governments may clamp down on moves to transfer currency out of the country. Research shows that interest in cryptocurrencies tends to rise in the midst of economic upheaval, exemplified by such events as Brexit and the U.S.-China trade war.¹⁴⁷

The introduction of stablecoins helped to mitigate such concerns as they provide access to stable currencies like USD and EUR. The most popular version of stablecoins at present is fiat currency-backed stablecoins collateralized by a 1:1 equivalent amount of fiat currency. When the fiat currency is deposited, the coin provider creates (mints) a new set of coins equivalent to the collateral held. The coins can then move freely in the cryptocurrency ecosystem, being spent, traded, or deposited in a digital wallet and held. In all instances, they maintain their value in relation to the fiat currency.

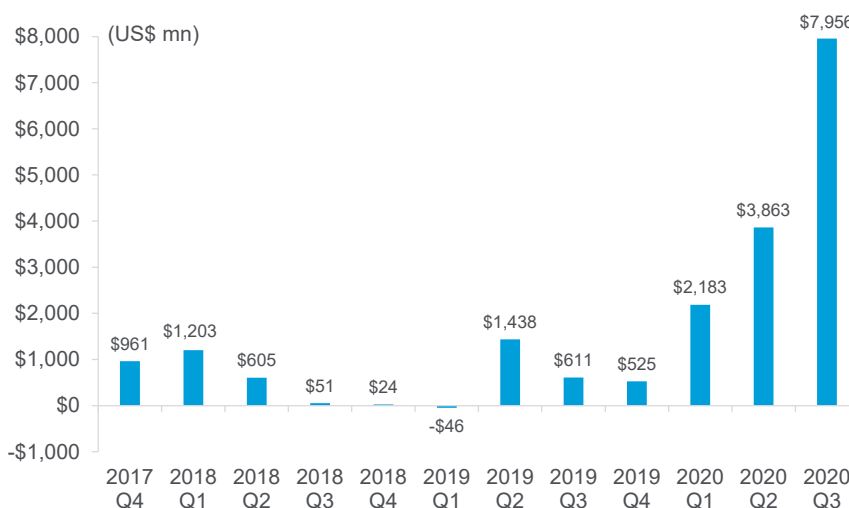
Rather than having to enact an open market transaction to convert their stablecoin back into the fiat currency (and hope that the exchange rate has not moved adversely), holders of stablecoins can instead redeem them directly with the coin originator and receive the equivalent amount of fiat currency back from the collateral account. The stablecoin itself is then destroyed (burned) when the collateral is removed.

Interest in fiat currency stablecoins is surging. Nearly +\$8 billion were added to the aggregate supply of stablecoins in the third quarter of 2020, nearly doubling the industry's supply from \$11.9 billion at the end of the second quarter to just below \$20 billion, according to Coin Metrics data.¹⁴⁸ Figure 27 shows how extensively demand for stablecoins has grown in the past year.

¹⁴⁶ "Cryptocurrency on PayPal FAQs", [PayPal](#), January 2021.

¹⁴⁷ "Fiat Pegged Stablecoins as the Stepping Stone to a Global Currency", Daniel Popa, [Hacker Noon](#), September 28, 2019.

¹⁴⁸ "Total Stablecoin Supply Nearly Doubled in Q3", Zack Voell, [CoinDesk](#), October 1, 2020.

Figure 27. Net Monthly Supply Change in Circulating Stablecoins

Source: Coin Metrics, CoinDesk Research

Several factors are driving this growth. Demand for dollar liquidity in crypto markets surged in response to economic concerns and upheaval in response to the COVID-19 crisis. At present, nearly all of the early fiat currency stablecoin offerings have been based on the U.S. dollar. Digital market analysts noted the jump in stablecoin activity, which began in March 2020, may have reflected investors trying to move money out of their domestic currencies with the reasoning it might be easier to exchange their local currencies for stablecoins than to obtain U.S. dollars within the traditional banking system.¹⁴⁹

Another factor driving the growth was the explosion in decentralized finance (DeFi) activity occurring in the on-chain ecosystem as noted in Section III. Digital analysts reported a growing number of hedge funds and over-the-counter trading desks were moving funds to one of the leading stablecoins for “faster arbitrage and reactions to market movements.”¹⁵⁰ By the end of 2020, indications were that stablecoins were being used as collateral for an increasing number of derivative products being traded on-chain.¹⁵¹

This marks an important change in the trading profile of the crypto landscape. Initially, almost all altcoin trading was done against Bitcoin as the default pairing. With the introduction of Tether and other U.S. dollar stablecoins, more and more pairs are now starting to be quoted against the stablecoin, underscoring how the crypto-fiat bridge is being forged more directly.

Early activity in the space has not been without controversy, however. The New York State Attorney General’s office started investigating Tether after a report from the firm’s general counsel in April 2019 indicated the Tether supply at the time was only 74% backed by fiat equivalents.¹⁵²

¹⁴⁹ “Cryptocurrencies are Evolving Fast—Can Stable Coins and Central Bank Digital Currencies Co-exist?”, Sean Stein Smith, [Forbes](#), December 16, 2020.

¹⁵⁰ “Total Stablecoin Supply Nearly Doubled in Q3”, Zack Foell, [CoinDesk](#), October 1, 2020.

¹⁵¹ “Tether Mints Record \$2B USDT in One Week”, Zack Voell, [CoinDesk](#), January 11, 2021.

¹⁵² Ibid.

By the end of 2019, the general counsel amended that statement and indicated “Tether is fully backed, full stop.”¹⁵³ Concerns have not impacted its growing adoption. Tether minted \$2.0 billion-backed stablecoins in the first week of 2021.¹⁵⁴

Concerns about the Tether situation and the rapid growth of U.S. dollar stablecoins prompted the President’s Working Group on Financial Markets, whose members include the heads of Treasury, the Federal Reserve, the Securities and Exchange Commission, and the Commodity Futures Trading Commission, to issue guidance in December 2020 indicating that stablecoins should be designed to be resilient enough to handle large-scale redemptions. The group added that “strong reserve management practices should include ensuring a 1:1 reserve ratio and adequate financial resources to absorb losses and meet liquidity needs.”¹⁵⁵

The announcement was followed in early January 2021 by the OCC letter about banks being able to make payments in stablecoins.¹⁵⁶ These developments should not be surprising.

The financial design of a stablecoin is not at all novel. Indeed, they are just a claim on dollar (or other fiat currency) reserves held by a regulated institution such as a commercial bank. In a sense, it is no different than a paper check, prepaid debit card, e-money, or Venmo balance.

What makes stablecoins unique is they can operate within the blockchain ecosystem and as they are being built on a smart contract, can be made programmable to fulfill specific mandates. Moreover, in line with the censorship resistance ethos of the Bitcoin founder(s), they can be owned by anyone, not just those vetted via traditional Know-Your-Customer (KYC) procedures.

Nearly all fiat currency stablecoins are U.S. dollar backed at present, but in early December 2020, one of the oldest banks in Germany, Bankhaus von der Heydt (BVDH), established in 1754, announced it is working with a tokenization and digital asset custody technology provider to facilitate the first direct issuance of a Euro-backed stablecoin. The move not only expands the pool of fiat currency stablecoins but also marks the first time a traditional fiat currency banking institution is becoming a direct participant in the on-chain ecosystem.¹⁵⁷

At the end of 2020, GMO, the Tokyo-based internet conglomerate and one of the world’s largest online FX trading platforms received a New York State trust charter to allow the organization to issue, administer, and redeem Japanese Yen and U.S. dollar-pegged stablecoins.¹⁵⁸

¹⁵³ Ibid.

¹⁵⁴ Ibid.

¹⁵⁵ “US Warns Crypto Stable Coins on Money Laundering, Risk Controls”, Benjamin Bain, [Bloomberg](#), December 23, 2020.

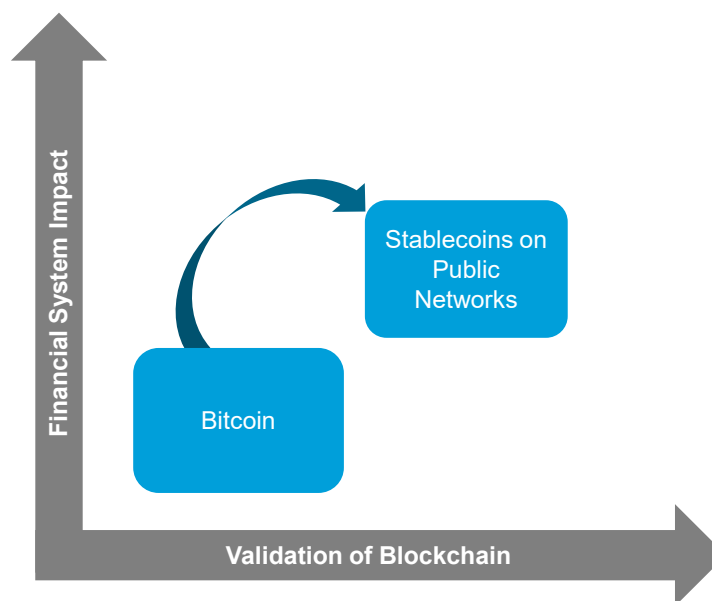
¹⁵⁶ “US Federal Regulator Says Banks Can Conduct Payments Using Stablecoins”, Nikhlesh De, [CoinDesk](#), January 4, 2021.

¹⁵⁷ “Bitbond and Bankhaus Von Der Heyt Issue Euro Stablecoin (EURD) on the Stellar Network”, [PR Newswire](#), December 9, 2020.

¹⁵⁸ “Japanese Internet Giant Licensed to Issue First JPY-Pegged Stablecoin in New York”, Benjamin Powers, [CoinDesk](#), December 29, 2020.

A slew of non-dollar stablecoins may soon follow and other banks or trading platforms may soon determine whether this is an appropriate way for them to participate. Such moves further intertwine the fiat currency and cryptocurrency networks, validate blockchain as a new set of payment rails, and build confidence that Bitcoin, the original and most widely adopted cryptocurrency offering on blockchain, is a safe form of payment. As shown in Figure 28, these moves work to broaden the impacts on the overall financial system.

Figure 28. Innovations on Blockchain Broaden Cryptocurrency Impact on Financial System



Source: Citi Business Advisory Services

“ There is a massive demand in emerging markets for stablecoins. Consumers can use stablecoins to hedge themselves in dollars without multiple intermediaries. Stablecoin use will continue to grow in emerging markets.

– CRISTIÁN BOHN, PARFIN

”

“ One of the early things where we saw a lot of traction was people in Argentina using Dai to hold U.S. dollars on their phone, instead of having to hold crumpled up dollar bills.

– RUNE CHRISTENSEN, MAKERDAO

”

“

I think for the most part there is a large group of people getting involved looking to earn 7-8% in stablecoin return without going all in. We have seen quite a bit of flow with that capital. We've seen the price of Bitcoin and Ethereum ebb and flow, and people have figured out that picking tops and bottoms is very hard so they are going to buy and hold.

– MICHAEL MORO, GENESIS TRADING

”

Cryptocurrency and Asset-Backed Stablecoins Offer New Use Cases

Fiat currency-backed stablecoins are not the only type of stablecoins being created within the public networks of the on-chain ecosystem. While one set of stablecoins use fiat currency for collateralization, another set use cryptocurrencies as collateral for their offerings. One of the incentives for this approach is the entity responsible for minting and burning the coins can be wholly decentralized and not reliant on a centralized organization such as a bank to manage the collateral.

This decentralized approach is very much in tune with the ethos of the blockchain communities and is the source of a lot of new experimentation. Governance is a major component of these new offerings.

Without a centralized 'management team', these new types of businesses allow individuals to self-select to be part of a governance community by issuing and allowing for the purchase and sale of a separate type of 'governance' coin with specific types of voting rights. Because they are programmable, the governance coins can embed the rights and responsibilities of its owners' right into the asset. Issues and proposals that affect how the stablecoin operates are then put out for the entire of community of governance coin holders to vote upon. A simple majority is the only requirement to enact decisions.

Governance coin holders are incented by the potential increase in the value of their tokens. If they make bad or overly risky decisions, theoretically the follow-on effects would reduce the value of their tokens. An analogy might be having shareholders in a bank make all the governing decisions directly and thus be rewarded by seeing the value of their bank shares go up if they manage the company well or go down if they make bad choices.

MakerDAO offers an example of this decentralized autonomous organization (DAO) approach. Individuals that purchase the Maker governance token (\$MKR) are able to vote on issues such as whether to allow for new types of collateral to be accepted to back the entity's DAI stablecoin. That stablecoin is user-generated by individuals. They deposit cryptocurrency collateral into a Maker 'Vault' and then a smart contract — the automated code of the protocol — mints a commensurate amount of DAI.¹⁵⁹ The model is similar to how pawn shops work today, or to how the earliest types of paper money were utilized in Europe, where receipts were issued by goldsmiths who then held client's coins as collateral.

Typically, these stablecoins are over-collateralized to make up for the potential volatility of the cryptocurrency deposits. Rather than a 1:1 collateral to coin relationship, as is pursued in the fiat currency stablecoins, cryptocurrency-backed stablecoins often come with a 2:1 or more ratio of collateral to coins.

Most of the early use cases for DAI were for borrowing against cryptocurrency to get liquidity in dollars or placed a levered bet on crypto appreciation, but emerging use cases are beginning to cross from the crypto into the fiat domain. MakerDAO is now allowing the financing of physical world projects such as construction loans as a new type of collateral obligation.

¹⁵⁹ [MakerDao.com](https://makerdao.com).

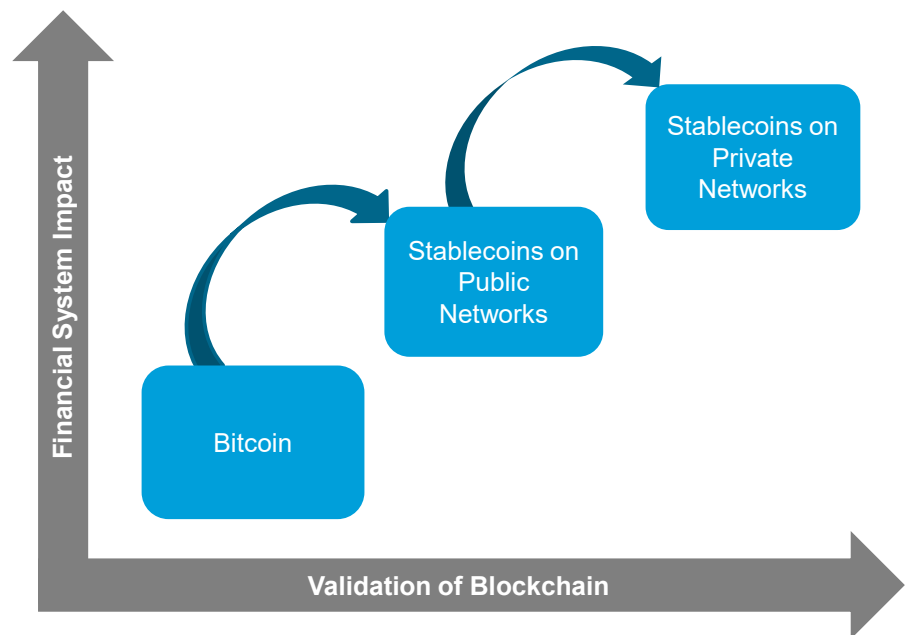
Other stablecoins also follow this hybrid approach. Uphold, a digital investment platform, announced the launch of a new gold-backed stablecoin (UPXAU) in July 2020. This offering uses cryptocurrency purchases to instantly buy physical gold from the Government of Western Australia. The buyer of the stablecoin can then request an Uphold credit card loaded with a value equivalent to their gold holdings to make purchases with or they can take physical delivery of their gold via Federal Express. Uphold CEO explains: “One token equals one gold certificate equals one ounce. One to one to one. When you buy the certificate, you’re buying gold. It’s not hypothecated. It’s not fractional. You are buying gold.”¹⁶⁰

Each of these examples illustrate the growing entanglement of the fiat and cryptocurrency world.

Stablecoin Template Sets Stage for Introduction of Private Networks

Everything discussed thus far in this section is already occurring. Projecting the next evolutionary step is not difficult; however, because projects representing the next extension of the stablecoin template have already been announced and are due to launch in 2021.¹⁶¹ These initiatives create stablecoins that will only be used within private, closed networks rather than on the existing open access public networks. The launch of these private network stablecoins would further validate the blockchain payment concept, boost the reputation of Bitcoin, and transform the financial ecosystem dynamics as shown in Figure 29.

Figure 29. Innovations on Blockchain Broaden Cryptocurrency Impact on Financial System



Source: Citi Business Advisory Services

¹⁶⁰ Crypto-Gold: It's a Thing", Cory Johnson, [Forbes](#), July 20, 2020.

¹⁶¹ "Libra Plans Dollar-Pegged Stablecoin Launch in January 2021", Sebastian Sinclair, [CoinDesk](#), Nov 27, 2020.

The initiative that has garnered the most attention is the Facebook-led Libra project that has since been reimagined, re-staffed, and renamed Diem. Announcements made in early 2020 indicate that instead of the SDR-like Libra coin backed by a basket of fiat reserves envisioned by the Libra Association, the Diem team will issue single currency coins backed by their own type of fiat reserves.¹⁶²

What makes this product different from Tether or Circle's USDC dollar stablecoin is transactions made in the Diem stablecoins will not be validated by the anonymous miners of a public network like Ethereum, but rather by all of the member organizations involved in the Diem network. These include global brands such as Spotify, Uber, and Lyft, the Singaporean sovereign wealth fund, Andreessen Horowitz, as well as Facebook.¹⁶³

Unlike traditional payment systems, Diem is designed to minimize fees and eliminate them as a business model for network operators. While it has not been explicitly announced, there is a significant likelihood the companies who are part of the Diem Foundation will incentivize users of their services to pay for them in Diem as opposed to in fiat currency. Such a move might enable companies to recoup the fees that they pay out to traditional payment networks.

Removing some of the frictions associated with traditional payment networks is another impetus to explore private network stablecoins. To that end, JPMorgan has created a unit called Onyx within their wholesale banking division to experiment with blockchain-related solutions and designed its own 'JPM Coin' to improve the movement of money within its balance sheet, such as for cross-border payments or securities settlement.¹⁶⁴ To enable their product, JPMorgan built a private version of the Ethereum blockchain network called Quorum that was later spun out and has also developed a separate Quorum-based network for payments-related data exchange called Liink.¹⁶⁵

Whether a single bank coin can gain widespread adoption remains to be seen. Similar to the Diem Foundation, however, there is potential for a consortium of leading banks to create their own private network to facilitate wholesale or retail payments. This could become a model for other companies operating in a closed ecosystem as well. Any industry where there are a defined set of participants across the supply and demand chain might see their payment costs cut and their efficiency improved through the use of private network stablecoins.

Governments Contemplate the Creation of Central Bank Digital Currencies

Monitoring whether these private network stablecoins gain traction and whether other private networks emerge will be important to determine how significant the re-wiring of the financial system may become. Figure 30 shows how these dynamics might play out.

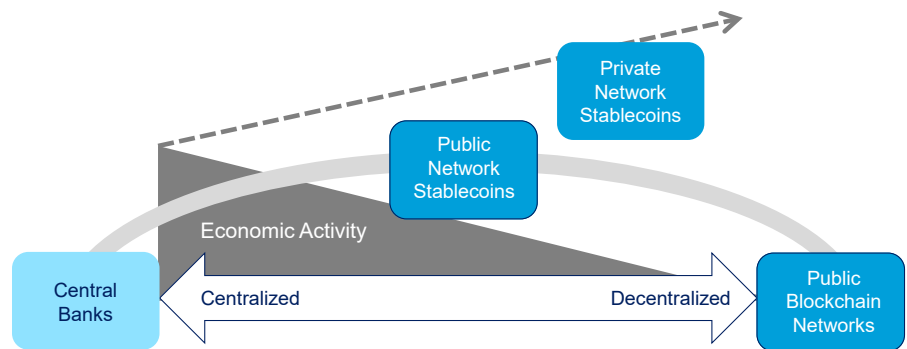
¹⁶² Libra Rebrands to 'Diem' in Anticipation of 2021 Launch", Nikhilesh De, [CoinDesk](#), December 1, 2020.

¹⁶³ "What is Diem? Introduction to the Facebook-Backed Stablecoin", Mike Dalton, [Crypto Briefing](#), December 17, 2020.

¹⁶⁴ "Ordinary Stablecoin or XRP Killer? What We Know About JPMorgan Chase's New Cryptocurrency", Stephen O'Neal, [Cointelegraph](#), February 16, 2019.

¹⁶⁵ Ibid.

Figure 30. Potential for Growing Pressure on Government Control



Source: Citi Business Advisory Services

When Bitcoin launched and then other public blockchain networks emerged, these protocols were deliberately designed to be decentralized and to operate in a manner that made them exempt from government control. This put them at the opposite end of the spectrum from central banks who use their monetary power to set policy and oversee the transmission and circulation of their currency.

Public network stablecoins created a bridge between these two systems, and as a result, they are opening up the pathway to allow more economic activity to occur in the decentralized realm before moving back into the fiat world controlled by the central banks. Private stablecoin networks accelerate this migration as even more economic activities may now take place in pocket systems and be transacted with exclusive coins that are separate from both official fiat currency and from any cryptocurrency.

As this occurs, pressure may build for the central banks themselves to consider creating a digital version of their currency. Such a decision could take many forms.

At one extreme, the central bank may choose a general purpose model and directly issue digital currency to both individuals and businesses, run its own national system of digital wallets, and verify and log transactions via their own private verification network.

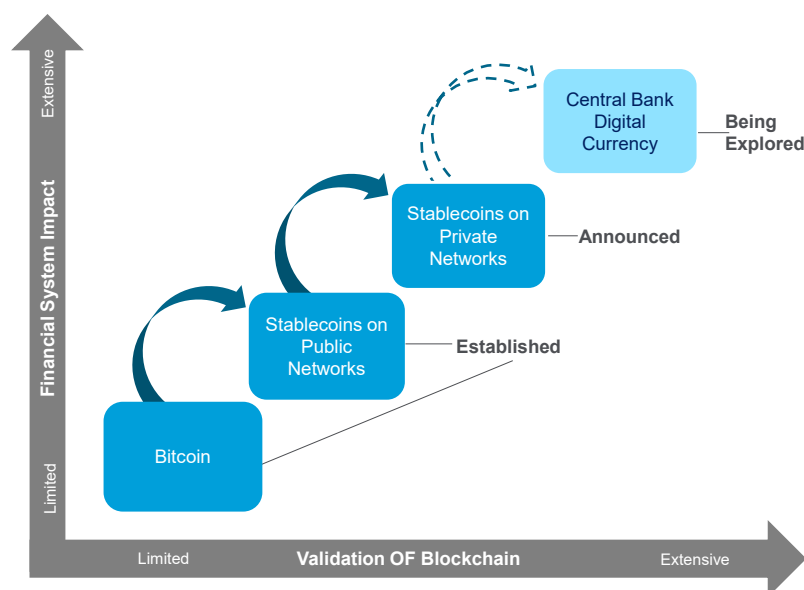
At the other extreme they may choose to leverage the existing banking system and issue digital coins solely to commercial banks and licensed entities that can be used to facilitate bulk transaction settlement with others in the central bank orbit. This would position commercial banks and licensed entities to hold the digital currency on behalf of individuals and corporations in private network digital wallets, much like they hold deposits in dual-entry ledgers today.

China is experimenting with this second approach. The People's Bank of China has been working with banks and commercial entities on public pilots to gauge user experience ahead of the introduction of a digital Yuan. They have held several 'red envelope' lotteries where users can register to be part of a giveaway with winners getting a direct deposit of the digital currency into their wallet after which they are given a designated time window to spend the money with local merchants.

Another of the country's large banks is also allowing for citizens in the city of Shenzhen to deposit and withdraw digital Yuan from ATMs directly into their mobile apps.¹⁶⁶

As shown in Figure 31, any move to have central banks consider their own digital currency using some version of this technology, regardless the level of public access, would mark the ultimate validation of the blockchain and result in a completely new financial system where digital wallets, stablecoins, and cryptocurrencies become standard offerings alongside existing checking and savings accounts, fiat currency, and traditional payment rails.

Figure 31. Innovations on Blockchain Broaden Impact on Financial System



Source: Citi Business Advisory Services

Global Accessibility of Bitcoin May Spur Future Transition to Trade Facilitator

If this future were to unfold, perceptions about what makes Bitcoin important in the new ecosystem could morph once again. Three such transformations have already occurred. The initial focus of Bitcoin was on its underlying technology and then on its utility as a store of value. Most recently the focus has been on its scarcity. There is potential that in the future perceptions about Bitcoin might end up focusing on its global reach and neutrality.

If merchants can move seamlessly between the fiat, cryptocurrency, and stablecoin realms, there are certain advantages that Bitcoin may offer that differentiate it from central bank digital currency or from stablecoins. These include:

¹⁶⁶ "Chinese Bank Trials Digital Yuan Services at ATMs: Report", Tanzeel Ahktar, [CoinDesk](#), January 11, 2021.

- **Borderless Design:** Bitcoin is decentralized. No government owns or controls it and anyone globally can participate in the market, making it ideal to use as a universal settlement currency for negotiating contracts and supporting cross-border transactions. In countries experiencing currency volatility, Bitcoin might allow merchants to insulate themselves from such fluctuations.
- **Lack of FX Exposures:** Rather than having to utilize multiple currencies to move goods or offer services, trade partners could have their own Bitcoin wallets that can send and accept payments to other Bitcoin wallets. This could simplify contract language and remove potential exchange rate exposures.
- **Faster, Potentially Cheaper Money Movements:** Cryptocurrency transactions occur faster and more seamlessly than wholesale fiat payments. The transaction itself posts instantaneously and the actual transfer of funds can be accomplished in a matter of minutes and typically at much lower cost. The peer-to-peer nature of Bitcoin makes it hard for governments to tax or attach fees to such transactions.
- **Secured Payment:** The merchant or individual receiving Bitcoin knows the funds are secure because the entity sending the Bitcoin had to have had the money in their digital wallet in order to initiate the payment request. This reduces the risk of payments bouncing or credit transactions being cancelled.
- **Traceability:** The nature of the Bitcoin blockchain ledger means every transaction is transparent and trackable. Smart contracts can be designed to monitor these transactions. Tracking algorithms can monitor for a successful Bitcoin payment into a designated wallet in order to initiate the next step in a multi-step cross-border transaction or monitor the movement of goods into or out of a specific country's customs database in order to trigger the release of Bitcoin payments. This could transform the logistics of international commerce.

All of these attributes are as true today for Bitcoin as they are likely to be in the future, but thus far its use in international trade has been limited. The main problem is the volume of transactions the Bitcoin network can handle. Analysis from early in 2020 shows Bitcoin executed on average only 5 transactions per second which is 4,800 times slower than the Visa network that handles 24,000 transactions per second.¹⁶⁷

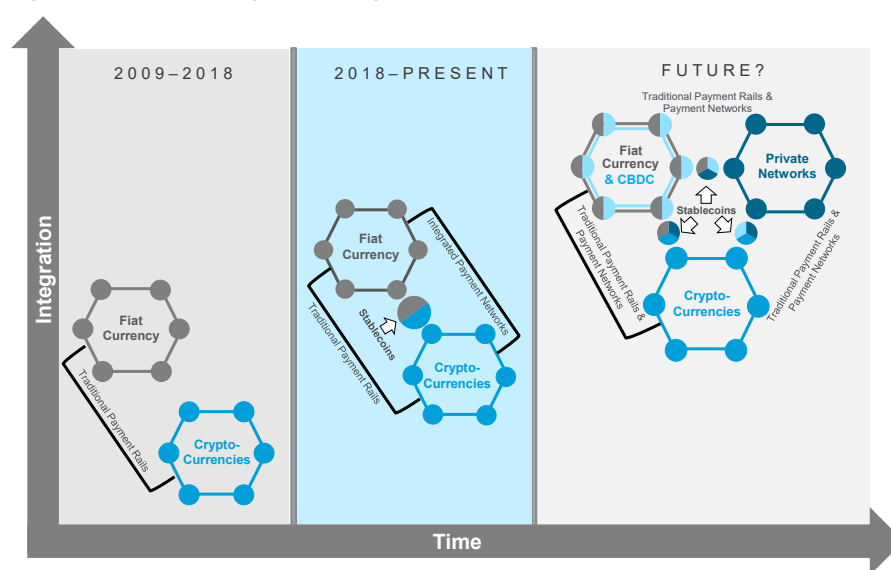
Efforts to improve Bitcoin's processing speed are underway. Current initiatives are centered on a new type of scaling technology called the Lightning Network. This approach creates a processing layer that sits above the actual blockchain where transactions happen quickly and cheaply, but are only periodically reconciled on the main chain. This is analogous to commercial banks using the Fedwire system for settling large value transactions amongst themselves and internalizing transactions for clients.

¹⁶⁷ "Crypto vs Visa Transactions' Speeds Compared", [PaySpace Magazine](#), January 20, 2020.

Early concerns about the security of this approach are being addressed. Kraken, one of the most established Bitcoin exchanges, announced in December 2020 it would be integrating the scaling technology into its network in the first half of 2021. According to an exchange spokesperson, “the lightning network has matured to a level where it can be used by Kraken. It’s what our users are asking for. They want instant and efficient payment.”¹⁶⁸

Other factors limiting Bitcoin’s use in trade primarily have to do with its acceptance in the global marketplace. Many countries are still skeptical of Bitcoin and some have even banned its use. This is why the validation of blockchain and changes to the existing financial system may need to occur before this future use of Bitcoin as a trade facilitator becomes a possibility. The outlines of a future ecosystem where Bitcoin might fulfill this role are beginning to come into focus, however, as shown in Figure 32.

Figure 32. Evolution of Payments Ecosystem



Source: Citi Business Advisory Services

In this vision, CBDCs might exist right alongside traditional fiat currency. The maturation and proliferation of private stablecoin networks may also result in there being many trade ‘groups’ that each have their own private network coins that they use for transactions within their network. Digital wallets might thus hold cryptocurrency, one or several private network coins, and CBDCs all at the same time. This would allow participants in any of the networks to use their holdings as collateral and create a stablecoin to engage with participants in other networks.

In this potential future, importers and exporters may change the way they think about trade. Rather than engaging in a string of currency or stablecoin exchanges in order to move goods and pay for services, they may instead choose to use a single currency where transfers can be made directly.

¹⁶⁸ “Kraken Will Integrate Bitcoin’s Lightning Network in 2021”, Colin Harper, [CoinDesk](https://www.coindesk.com/kraken-will-integrate-bitcoins-lightning-network-in-2021/), December 16, 2020.

A decentralized cryptocurrency might be preferred as no government or outside entity can take steps that might affect the supply of the trade currency, helping to decouple trade from political considerations. While the U.S. dollar is often the default trade currency today, growing tensions between the U.S. and China are creating concerns about the future.

The most well-established and liquid cryptocurrency is Bitcoin, making it the likely beneficiary of a move to a new crypto trade currency. Bitcoin would be able to move from one trade partner's digital wallet to the other's wallet with little friction. As the 'international trade' currency, those engaged in cross-border activities may leave their Bitcoin in their wallets until the funds are needed. Follow-on transactions could be contracted and conducted without any need for a currency exchange. Funds could move back and forth within the Bitcoin network and only be withdrawn and exchanged when account owners needed money to operate in a local economy.

Even trade within private networks may move to Bitcoin. Participants in these networks may transact within their ecosystem in their own private coin, but sooner or later, they are likely to want to transfer their holdings back into a fiat currency. The desired fiat currency may be different for each member of the private network.

A Coffee Coin Example

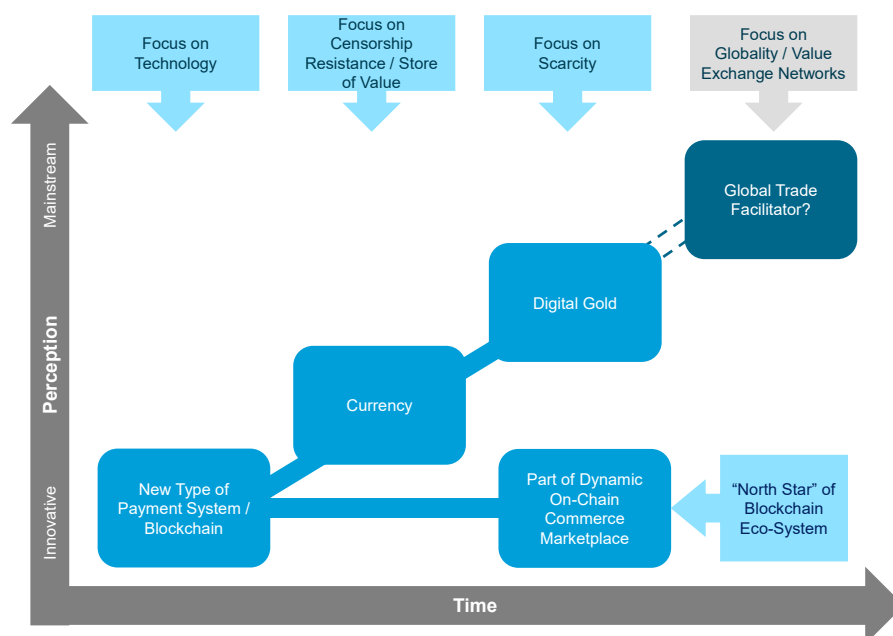
Let's say that there is a private network for companies engaged in the coffee trade. Growers and importers both join up and they create a "Coffee Coin" to facilitate trade within their network.

Transactions between all members of the network could occur in the Coffee Coin, but upon the completion of a transaction, growers in Brazil would want to exchange the tokens they receive for their exports back into the Brazilian Real. Growers in Vietnam would want to move their tokens into the Vietnamese Dong. An importer in the United States would want to trade in their tokens for US Dollars and an importer in Italy would want to redeem in Euros. Rather than creating a multi-currency basket of fiat offerings to back a private coin or using US dollars or another fiat currency that would require members to enact an FX conversion, it might be easier for all of the members to agree that they would use Bitcoin as the neutral currency to collateralize the Coffee Coin.

Contracts would be written whereby exports and imports would be paid for in Bitcoin-backed coffee tokens. Importers would monitor the ports of the export countries and mint "coffee tokens" when shipments left by depositing Bitcoin into their private network wallet. These tokens would then be transmitted into the digital wallet of their trade partners. The trade partners would receive the Coffee tokens and burn them, redeeming them for Bitcoin. They could then hold that Bitcoin in their wallet to pay for new equipment or other business expenses that they might need to procure from any international trade partner, avoiding any potential fluctuation of value, or they could exchange the Bitcoin back into their local digital fiat currency to use within the domestic economy as required based on their business need.

This final potential iteration of Bitcoin is illustrated in Figure 33. If achieved, this would mark the mainstream acceptance of Bitcoin.

Figure 33. What is Bitcoin? Part 4



Source: Citi Business Advisory Services

“ Bitcoin has been the inspiration for a host of imitators that share the founding ideology of a trustless, peer-to-peer world without central issuers and intermediaries. In an ironic plot twist, central issuers and intermediaries have sought to adopt this technology for their own ends. They may not subscribe to the Bitcoin manifest, but they believe that digital tokens might provide a better technical architecture for modern money.

– TONY MCLAUGHLIN, EMERGING PAYMENTS AND BUSINESS DEVELOPMENT, TREASURE AND TRADE SOLUTIONS, CITI

”

“

Bitcoin is a new monetary system; an open, global, public, and borderless monetary system. It doesn't happen often that we get to witness a monetary system transformation. Bitcoin means different things to different people, but Bitcoin itself is a network and an asset that has properties of good, sound money.

– JURI BULOVIC, FIDELITY CENTER FOR APPLIED TECHNOLOGY

”

“

Blockchain can give anyone the tool to improve their financial condition, and our mission is to create an unbiased world currency so you can have a monetary system that anyone can access wherever they are, regardless of being rich or poor. They can then get first-class access to financial services, which means saving money in dollars, and getting access to other financial services.

– RUNE CHRISTENSEN, MAKERDAO

”

Section V

Obstacles Remain that Could Slow or Reverse Bitcoin's Progress

The vision presented in Section IV outlines a highly optimistic future for Bitcoin, tied to its role as the North Star of the blockchain ecosystem and based on the continued validation and intermingling of the emerging and legacy payment infrastructures. Moving from where we are today, however, to the achievement of that potential future would require several existing and potential issues with Bitcoin to be addressed. The manner, speed, and ability of Bitcoin and the altcoin ecosystem to address such concerns may determine whether or not the potential future outlined in Section IV comes to fruition.

Institutional Adoption Can Only Go So Far in the Current Environment

The entry of institutional investors into the cryptocurrency and Bitcoin space has been one of the factors helping to spark increased confidence about the future of these assets. There are, however, several persistent issues with the way in which this ecosystem operates that are likely to limit institutional adoption until solutions to the underlying concerns emerge. The following points summarize such considerations.

Capital Efficiency:

One of the concerns that came up most frequently in the interviews we conducted with industry participants was frustration about the lack of capital efficiency in the way both Bitcoin and other cryptocurrencies are utilized. All of the trading and financing occurring with these cryptocurrencies is pre-funded and often over collateralized.

For institutional investors, this means their capital would be effectively locked up. There is no unsecured financing available. Leverage in the system is limited and operates more like a Reg T margin account where participants can only lever their direct account holdings by 100% and no more. At best, a wallet with 10 Bitcoin valued at \$40,000 each (\$400,000) would only be able to have lending lines equivalent to \$800,000 (200% gross) and they would need to leave the \$400,000 of Bitcoin they actually own with the entity loaning them the \$800,000 as collateral — further reducing their actual leverage.

Many institutional investors seek much higher velocity of leverage on their money, often putting down as little as 10% in certain investments in order to have access to a much larger exposure.

Insurance and Custody Concerns:

Unlike fiat currency holdings, Bitcoin and other altcoins held in digital wallets are not government issued and thus lack the protections such currency typically possess. Moreover, Bitcoin and altcoins are held in decentralized digital wallets which themselves are new creations. The mechanics around how to best custody and protect the assets held in such structures are still under debate. As noted in Section II, new multi-party computational (MPC) technology offers one approach on how to custody a wallet owner's private key, but having that mechanical solution is only a piece of the puzzle.

Institutional investors, including high-net worth individuals, are either mandated, or choose to use a third-party digital custodian to store their assets. This shifts the responsibility of securing the assets to the entity that in turn has secured insurance to help protect the organization and its client assets. The vast majority of participants in the space at present are new entrants and are not affiliated with a recognized global custody bank. Indeed, the first announcement of an established player entering the space only emerged in December 2020 when Northern Trust and the venture arm of Standard Chartered announced they were forming Zodia, an institutionally focused crypto custodian.¹⁶⁹

There are two issues with the lack of a recognized, regulated brand name players in the digital asset custody space. The first is it forces institutional investors to split their holdings. Fiat currencies and fiat currency-valued assets are typically held with a traditional custodian and digital assets are held with a newer, third-party custodian. This limits the institution's ability to optimize their potential collateral decisions by forcing them to model their asset pools separately, splitting their buying power and forcing them to create and monitor multiple processes for instructing and moving collateral.

The second issue limiting institutional adoption relates to asset protections. In the U.S. and many other nations, bank deposits are insured up to certain levels by the issuing government and custodians are able to augment such arrangements by obtaining extensive amounts of liability insurance to instill consumer confidence in their assets being secure.

Several factors limit the ability of third-party digital asset custodians to offer the same. These include: "lack of claims or industry data to price risk, shortage of quality institutional buyers with the attributes necessary to build a pool of similar risk and thus spread and mitigate aggregation of risk; high volume of submissions from cryptocurrency companies not able to pay the requisite premiums in order to fund significant losses."¹⁷⁰

Insurance for digital custody does exist, but interviewees noted that the cost is high and amount of coverage limited. More maturation will be needed in these solutions to enable extensive institutional growth.

Continued evolution of the regulatory space may speed the development of potential insurance remedies. In December 2020, the SEC announced they would allow "crypto-focused broker-dealers to operate for five years without fear of an enforcement action provided that they can verify if they have possession and control of customers' digital asset securities."¹⁷¹ Industry players greeted the news positively. The executive director of the Blockchain Association noted, "Regulatory certainty on this issue will enable the custody marketplace to develop and give consumers the confidence they need that their digital assets are safe and secure."¹⁷²

¹⁶⁹ "Standard Chartered and Northern Trust Partner to Launch Zodia, a Cryptocurrency Custodian for Institutional Investors", [Northern Trust](#), December 9, 2020.

¹⁷⁰ "Insurance for Digital Currencies: What Clients Need to Know", [Bitgo](#).

¹⁷¹ "SEC Gives Broker-Dealers Room to Handle Crypto Securities", Nikhileah, [CoinDesk](#), December 23, 2020.

¹⁷² Ibid.

Security Concerns:

The security of the marketplace, not just of the assets held in digital wallets is another source of concern. Right now, Bitcoin and the cryptocurrency markets are experiencing a positive virtuous circle with regards to institutional participation. More institutional participants are entering because the presence of other institutions is giving them the confidence to proceed. That dynamic could reverse if there were to be a high profile breach.

Such events are not at all uncommon as shown in Figure 34. Several hacks of the Bitcoin network have occurred. The Mt. Gox event in 2011 resulted in nearly 800,000 Bitcoins being stolen and though no other event has risen to that threshold, the Bitfinex hack in 2016 resulted in a nearly 120,000 Bitcoin loss.

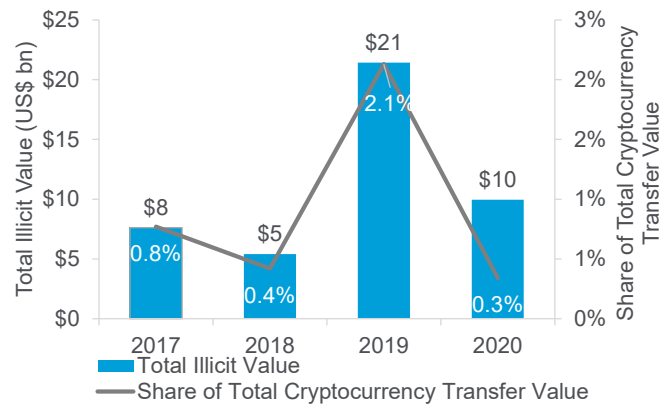
As the value of Bitcoin rises, the dollar value of the losses is also a growing concern. In 2018, during the prior Bitcoin bull market, CoinCheck was subject to a hack resulting in the theft of \$487 million worth of an altcoin, more than double the value of the Bitcoin lost during the Mt. Gox event (\$231 million). No other event nearing those levels has occurred since 2018, but the potential remains for a hack to undermine confidence in the system.

Figure 34. Crypto Hacks

Date	Exchange	Amount Stolen (\$)	Amount Stolen (Units)
2011	Mt. Gox	\$230,928,049	792,500 BTC
2014	Poloniex	\$64,231	97 BTC
2015	Bitstamp	\$5,333,230	18,866 BTC
2016	Bitfinex	\$72,200,000	119,756 BTC
2018	Coincheck	\$487,387,361	43,611 BTC
2018	Bancor	\$23,500,000	3,504 BTC
2019	Cryptopia	\$16,000,000	4,171 BTC
2019	Bithumb	\$19,100,000	4,732 BTC
2019	Binance	\$41,167,638	7,074 BTC
2019	BITPoint	\$32,000,000	2,821 BTC
2019	Upbit	\$49,116,778	7,003 BTC

Source: Cointelegraph

Figure 35. Share of Illicit Crypto Activity



Source: Chainalysis

Concerns about illicit or illegal activity due to the anonymous nature of transactions on the public blockchain are another point of consideration for institutional participants that have a fiduciary duty to protect their clients' assets. Figure 35 shows that Bitcoin along with a slew of other cryptocurrencies have indeed been subject to the illicit transfer and receipt of coins with such activity topping \$20 billion in 2019 before falling back to only \$10 billion in 2020. However, the extent of such activity can often seem overblown based on news headlines alone. In total, just over 2% of the activity in the cryptocurrency space was linked to illicit activity in 2019 and that total was down to only 0.3% in 2020.

To put that figure in context, a payments study commissioned by the Federal Reserve found that fraud represented 13.46% of aggregate credit and debit card network activity in the U.S. in 2016 and that the number of illicit transactions in depository institutions reached 4.38% of total.¹⁷³

Moreover, as noted in Section II, the public blockchain is not anonymous, but pseudo-anonymous. Every transaction is traceable to specific nodes and a growing set of chain analytic tools are creating pathways to look through to and analyze those nodes and trace their activity.

After the attack on the U.S. capital on January 6, 2021, reports emerged that a transfer of 28.15 Bitcoins worth more than \$500,000 had taken place less than one month earlier with funds being dispersed to 22 different virtual wallets, most of which belonged to prominent right-wing organizations and individuals. Chainalysis investigated the transactions and was able to trace the source of the funds to a deceased French citizen, kicking off a federal counterintelligence investigation to determine if foreign entities or governments were involved in funding the attempted U.S. insurrection.¹⁷⁴

Open Questions Around Tether

Just as a high profile breach of security and theft of Bitcoin or other cryptocurrencies might undermine confidence in the system and lead to a reversal of the virtuous circle of institutional participation, a regulatory crackdown triggered by rumors of a broadly owned stablecoin not being fully backed could also cause a loss of confidence.

To that point, an anonymous blog circulated in mid-January 2021 described Tether as a possible “doomsday machine”.¹⁷⁵ More telling than the arguments presented in that post, most of which were recycled and readily disputed, was the amount of attention that it received outside of the crypto industry. Unlike its nearest competitor, USDC, Tether is not fully transparent and does not allow for the audit of its collateral reserve.

This lack of transparency has helped cast doubts on the solvency of Tether, but there are many established market participants that see no issue, a point underscored by the record amount of Tether minted in the early part of 2021 as discussed in Section IV.

As also noted, Tether’s issuer is already being investigated by the New York State Attorney General. In relation to that inquiry, the group admitted to temporarily lending some of its cash reserves to a sister exchange as a type of bridge loan that has since been fully repaid, and the stablecoin’s Bahamian bank is adamant that every token is fully backed.¹⁷⁶

¹⁷³ “Changes in US Payments Fraud from 2012 to 2016: Evidence from the Federal Reserve Payments Study”, [The Federal Reserve](#).

¹⁷⁴ “\$500,000 Bitcoin Funneled to Capital Riot Organizations”, Mish, [TheStreet](#), January 16, 2021.

¹⁷⁵ “The Bit Short: Inside Crypto’s Doomsday Machine”, [Crypto Anonymous](#), January 14, 2021.

¹⁷⁶ Story from Business Tether’s Bank Deltec Says Stablecoin Is Fully Backed by Reserves”, Omkar Godbole, [CoinDesk](#), January 22, 2021.

Part of the confusion over this product is based on its popularity in Asia where crypto exchanges are not allowed to hold bank accounts and therefore collateral deposits to mint Tether are often made with shadow-banking participants, not commercial banks. Tether's popularity with institutional participants that trade with OTC dealers may also make it harder to match up exchange holdings with Tether's overall market capitalization. Imbalances between Tether's market cap and exchange holdings was one of the key pieces of 'evidence' cited in the anonymous blog.

Moves toward determining a regulatory framework that requires auditing and reporting is likely to help settle whether any of the leading participants are making false claims, but until then the situation remains a risk worth monitoring, as Tether dominates Bitcoin trading at many exchanges.

ESG Impact

The final factor that might start to undermine institutional adoption of Bitcoin or other cryptocurrencies relates to potential ESG considerations associated with the energy required to solve the cryptographic problems as part of Bitcoin mining. As more hardware is deployed to mine Bitcoin due to the rising price, the cryptographic problem required to add a block to the chain becomes harder to solve, requiring more energy to perform the proof of work. Whereas in the early days of Bitcoin such calculations could be done on laptops, specialized chips, and massive data centers are required to be competitive in mining today.

"Bitcoin's annual consumption (of energy) is estimated at around 77.8 terawatt-hours, up from 9.6 terawatt-hours in 2017", according to Digiconomist. Another index, compiled by the Cambridge Center for Alternative Finance, estimates a higher figure of around 108.4 terawatt-hours."¹⁷⁷

One paper suggests almost half of the world's Bitcoin mining capacity is situated in southwest China, where power is cheap, less taxed, and supplied by coal-fired plants as well as hydroelectricity. The Cambridge Center for Alternative Finance estimates coal accounts for 38% of miner power.¹⁷⁸

Together, the cumulative set of ESG-related concerns could become significant. Indeed, the Cambridge paper determined that "If Bitcoin mining was a country, its annualized estimated carbon footprint would be comparable to New Zealand at about 37 million tons of carbon dioxide."¹⁷⁹

With asset managers increasingly focused on their own firm's and their investment portfolios' ESG impacts and with many institutional investors already leaders in the ESG space, this consideration might inhibit their interest in Bitcoin. That said, Bitcoin mining is slowly popping up in places where there is an ample supply of renewable energy but not a lot of demand, including in Texas.¹⁸⁰

¹⁷⁷ "Bitcoin is an Incredibly Dirty Business" Lionel Laurent, [Bloomberg](#), January 26, 2021.

¹⁷⁸ Ibid.

¹⁷⁹ Ibid.

¹⁸⁰ "How Texas's wind boom has spawned a Bitcoin mining rush", Mike Orcutt, [MIT Technology Review](#), February 27, 2020.

Taken collectively, there are many potential issues that might impede institutional participation in Bitcoin, cryptocurrencies, and digital assets. Concerns about capital efficiency, custody arrangements, asset insurance, the security of the marketplace, the potential of false collateral claims, and ESG impacts must be addressed in a manner that continues to bolster confidence in the networks.

Moves taken to increase certainty about transacting in a regulated, safe manner may trigger other types of concerns about the future direction of the landscape, however.

“ I think insurance for the crypto space is still a mess. If you want to get insurance capacity in the hundreds of millions, you can only get it for cold storage. It's physical insurance just like diamonds in a vault. This is the type of insurance most use. We were able to obtain cyber insurance. We got tech liability insurance as well, and that was very difficult to obtain.

– MICHAEL SHAULOV, FIREBLOCKS

”

“ Electricity is one of the biggest costs for miners. Miners either source energy from the grid by entering into long-term power contracts or source it off-grid by going directly to an energy source.

– JURI BULOVIC, FIDELITY CENTER FOR APPLIED TECHNOLOGY

”

“ Balance sheet matters. What matters in equity prime will matter in crypto prime. Access to a cheap cost of funding will be a key factor.

– MICHAEL MORO, GENESIS TRADING

”

“

Bitcoin is an investable asset, but you won't make a range of daily payments with it. It will be on the fringe use cases for cross border remittances. It won't be how you pay for Starbucks. I can't see it in the next 5 years being used in day-to-day commerce. There's too much volatility, and there are many other good ways to make a payment.

– MORGAN MCKENNEY, COO OF GLOBAL CONSUMER BANK, CITI

”

Increased Regulatory Certainty May Trigger Crypto Native Backlash, Divide Liquidity

As noted throughout this examination, regulators are beginning to define the contours of the digital asset marketplace and create the rule set that would allow for banks and regulated financial market participants to increase their participation and build out cryptocurrency supported products and services. While still a work in progress, the trajectory is pointing toward the 'mainstreaming' of the new investment and transactional rails over time.

Each step in that direction threatens to spark a backlash from the originators and early adopters who built the space. The regulatory imperative to supervise and monitor may prove incompatible with the ethos of the cryptocurrency community. The regulatory compliance culture relies on traditional tools like "know your customer", anti-money laundering, and the monitoring of financial rails to impose politically-motivated sanctions. This approach stands at odds with the desire to have a decentralized, user-controlled network available to all individuals that exists in an extra-judicial domain. Fears about the impact of the FATF Travel Rule are already beginning to highlight such a clash.

While some of the early pioneers in the crypto space may choose to view growing regulatory involvement as a natural part of a maturing ecosystem, others may resist the move. Many of the most innovative and talented developers may choose to withdraw from established platforms deploying more extensive oversight and monitoring. This could end up dividing the liquidity in the system.

Institutional participants and many individual investors may opt to remain in or enter the regulated portions of the digital ecosystem, committing increasing amounts of capital to the new landscape. This might fuel a near-term wave of growth, but over the intermediate to long-term, the valuations of regulated crypto businesses and the pricing of regulated Bitcoin, cryptocurrencies and digital assets may lose their innovative appeal and align to similar offerings in the traditional investment landscape. Just as exchange traded funds (ETFs) began as a distinct investment product and have since begun to morph into just another investment wrapper, we could see the novelty of Bitcoin and the blockchain ecosystem fade as the intermingling of the legacy and emerging systems progress.

Against this backdrop, another wave of disruptive innovation may occur with those developers that migrated away from the increasingly regulated marketplace perhaps applying their efforts to creating a new, more regulation-resistant type of crypto offering. Speculative capital and those investors looking to be part of an anti-establishment movement may follow. Over time, the backlash and desire to limit the migration of capital out of their regulated payment and investing rails may prompt governments to begin to intervene in that new space as well and the cycle would begin anew. Recently, the Central Bank of Nigeria sent a letter to local banks ordering them to close all bank accounts associated with cryptocurrency trading platforms as they sought to reiterate their stance on cryptocurrencies.¹⁸¹ Regulatory actions such as these could push more people to peer-to-peer platforms, which are already the preferred method in Nigeria.¹⁸²

¹⁸¹ "Nigerian Central Bank Says Its Ban on Crypto Accounts Is Nothing New", Sandali Handagama, [Coindesk](#), February 7, 2021.

¹⁸² "Binance Suspends Deposits in Nigeria Following Central Bank Directive", Sandali Handagama, [Coindesk](#), February 5, 2021.

Thus, Bitcoin's role as the North Star of innovation and the inspiration for an emerging ecosystem may fade and it may become just another currency alongside government-backed fiat offerings. The potential that another cryptocurrency may emerge to take Bitcoin's place is also something to consider.

Other Cryptocurrencies May Overtake and Displace Bitcoin

Bitcoin is the original and most well-known cryptocurrency, but there are many other altcoins emerging and their growth is beginning to outpace Bitcoin. The market capitalization of Bitcoin increased by 2.70x in 2020, but by 3.75x for other altcoins in the same period. The result is that the market dominance of Bitcoin is declining. While it is still the most liquid and well-funded coin, its market share fell to only 62% of the cryptocurrency space in 2020, down from 69% in 2019.¹⁸³

As noted back in Section III, on-chain commerce is being driven by the Ethereum platform that has its own cryptocurrency, Ether (ETH). A host of other competitors such as Polkadot and Tezos are also emerging and are looking to displace Ethereum's dominance as the destination hub for on-chain development. Each of those platforms also each have their own native digital currency.

These newer platforms offer programmable smart contracts and open protocols that make it easier for innovative developers to experiment and create new offerings to attract users. Everything from games to gambling to decentralized finance offerings are being created on these blockchains. To participate, users must pay in the platform's own coin. Thus, one of these platforms or a new competitor in the space may gain so much traction that its coin may overtake Bitcoin. The Ethereum platform already settles more dollar-denominated value than Bitcoin's platform.¹⁸⁴ The commerce platform may become the draw, much like the dominance of the Apple and Google app stores in today's mobile commerce ecosystem.

Commerce alone may not be the key driver. Because the emerging on-chain platforms are based on smart contracts, many rely on data inputs from the off-chain world to trigger certain actions or to effect payments. For example, a prediction site on the blockchain may offer a market around the winner of a grand slam tennis tournament, but in order to payout those that chose the correct player, they need a data trigger from a reputable source in the real world to confirm the winner. In this case, the contract terms may require affirmation via a World Tennis Association press release.

A new type of on-chain offering can identify the data input needed by the smart contract and scan real-world data sources, APIs, and payment systems for the requisite information which the network then delivers back to the smart contract. The leading such provider, Chainlink, describes their network as a "decentralized oracle" that searches for and imports data from the real-world and delivers it to the smart contracts that run in the on-chain universe.

¹⁸³ "Percentage of Total Market Capitalization (Dominance)", [CoinMarketCap](#), January 2021.

¹⁸⁴ "Flipped: Ethereum now processes 28% more transactions than Bitcoin", Samuel Haig, [Cointelegraph](#), January 19, 2021.

Originally designed for the Ethereum platform, it is starting to be adopted by others such as Tezos and Polkadot. Chainlink was recognized by the World Economic Forum which named the startup in its 100 most promising Technology Pioneers of 2020.¹⁸⁵

Developers that utilize the Chainlink network pay with the protocol's native token, LINK. Thus, a token that helps to facilitate the growth of the on-chain ecosystem may also gain prominence over Bitcoin in time as it becomes increasingly critical to the operation of the blockchain infrastructure.

It is thus already possible to envision a commerce-linked or infrastructure-linked coin that may eventually eclipse Bitcoin. More such possibilities may emerge. Innovation in the chain-based ecosystem is continuing apace and today's offerings may yet give way to a new invention that garners more attention and assets than Bitcoin.

Macro Environment May Shift and Siphon-off Institutional Interest

The final factor to monitor in order to gauge how much the institutionalization and growth of Bitcoin may progress relates to developments in the macro investment environment. As noted earlier in the paper, one of the reasons institutional investors are buying Bitcoin is to hold the asset as a hedge against inflation and currency devaluation. This argument focuses on the scarcity aspect of Bitcoin and knowing there is a finite supply of the currency, the totality of which will be in the market in just the next few years. In that sense, they are treating Bitcoin like they would treat gold or copper.

Inflation concerns are high because of the COVID-19-led quantitative easing policies adopted by central banks and governments and uncertainty about how quickly major economies will be able to recover. If the economic rebound exceeds expectations and the central banks and governments are able to scale back programs and begin to edge interest rates higher sooner than anticipated, such concerns may ease. Indeed, China posted positive economic growth in 2020 despite having been the epicenter of the COVID-19 outbreak and having been the first economy to mandate lockdowns.¹⁸⁶

Beyond easing the case for an inflation hedge, signs that the central banks are winding down their support might lead to more interest from institutional investors in re-allocating their capital back to the traditional equity and bond markets in expectation of more volatility and investment opportunity. Dampening institutional enthusiasm would remove a key source of support to Bitcoin and potentially the broader cryptocurrency ecosystem, thus pushing it back to its more speculative roots.

¹⁸⁵ "2020 has been Chainlink's Year. Here's Why", Adriana Hamacher, [Decrypt](#), December 25, 2020.

¹⁸⁶ "China Is the Only Major Economy to Report Economic Growth for 2020", Jonathan Cheng, [The Wall Street Journal](#), January 18, 2021.

“ The big question about crypto in general is what these other players are up to. My view is that is Bitcoin and Ethereum are the two dominant models where Bitcoin is digital gold and Ethereum is for application development, and I'm more excited about Ethereum. It's better suited for DeFi. We have this long-term view that while the number of blockchain projects continues to expand, there will ultimately be consolidation in blockchains in the longer term.

– ERIC STONE, FLIPSIDE

”

“ There are a lot of issues, which is common with early technology. Public blockchains are slow and expensive, but those are things that will hopefully be resolved in the next three years. It reminds me of the conversations around public cloud in 2013. People at banks said they wouldn't use Amazon Cloud service because it's unsecure and slow, but things evolved and it improved.

– MICHAEL SHAULOV, FIREBLOCKS

”

“ Proponents of tokens and accounts have different methods, but all roads lead to the kind of money we need to support the digital economy. Always on, programmable, instant, hyper-connected, embedded and secured through digital proof of the parties involved in each transaction.

– TONY MCLAUGHLIN, EMERGING PAYMENTS AND BUSINESS DEVELOPMENT, TREASURY & TRADE SOLUTIONS, CITI

”

Conclusion

The philosopher Schopenhauer once remarked that “All truth passes through three stages. First it is ridiculed. Second it is violently opposed. Third it is accepted as being self-evident.”¹⁸⁷ Though this sentiment was expressed more than 150 years before the emergence of Bitcoin, the introduction and evolution of the cryptocurrency illustrates this very human response to change.

The idea that a new payment system relying on a decentralized cryptographic approach to facilitate transactions in an extrajudicial manner might gain traction and challenge traditional payment rails seemed like a pipedream in the early days of its release. This gave way to denouncements and restrictions as governments, banks, and regulators sought to limit its growth. As recent events have shown, however, that resistance may now be melting away.

Large institutional investors and organizations are choosing to participate in and support Bitcoin. Regulators are beginning to lay the groundwork for the asset to potentially enter the mainstream. Governments themselves are being pressured and many are re-considering their own currency offerings. The vision of Bitcoin as a force that will transform the world may seem self-evident in just a few more years. The fact this progression has occurred in just over a decade makes Bitcoin remarkable regardless of its future.

Throughout this journey, the perception of what makes Bitcoin unique continues to morph. Bitcoin is now many things. To some, it is a payment system based on new technology set to potentially drive a re-wiring of the entire payments landscape. To others it is a new currency that can store value in a unique way and marks a new model of issuance beyond the control of any one nation. Many focus on the limitations imposed on Bitcoin's supply and liken it to digital gold, focusing on its value as an asset class. Those thinking about its future see the potential for Bitcoin to become a global facilitation currency helping to reduce the friction and complexity of cross-border trade.

What Bitcoin has undoubtedly become is the inspiration for a rapidly evolving blockchain-based economy. Its core innovations were the building blocks that launched this ecosystem and those innovations themselves are now being extended and levered in new ways that are remaking the world of commerce and finance. Bitcoin's existence has helped create a new landscape that in turn has spawned a whole set of altcoins and created a new, decentralized cryptocurrency market.

All of these views about Bitcoin's potential and how it influences and helps to inspire new business models emerging in the blockchain domain are what leads us to call it the North Star. Whether it maintains this position and how far the potential transformation it has inspired extends are both unknowable at this time, but Bitcoin's journey has clearly entered a new stage.

Our goal in this paper has been to help readers understand Bitcoin's past, present, and possible future. Armed with a fuller understanding of what has driven Bitcoin's growth and how it has spurred so much additional innovation and disruption should allow readers to better assess and determine their own view about Bitcoin's value and understand how future news may facilitate additional growth or force a retrenchment and re-evaluation of its potential.

¹⁸⁷ Arthur Schopenhauer, [Brainy Quote](#).

For all these reasons, we conclude by noting that Bitcoin is at the tipping point of its existence and the path forward from here may have broad and widening repercussions.

What is Bitcoin to You?

Digital Gold

"Bitcoin is digital gold, which is how it's viewed inside the Maker protocol"

-Rune Christensen, MakerDAO

New Type of Payment System

"I think Bitcoin a global leveling opportunity for everyone to participate in the financial ecosystem"

-James Stickland, Elwood Asset Management

"Bitcoin is the first global payment system that's accessible to anyone in the world"

-Jonathan Levin, Chainalysis

Currency / Money

"I think Bitcoin is the next stop on the evolution of money and value"

-Michael Sonnenshein, Grayscale

"Bitcoin is proof that the way global governments and economic systems have treated money is no longer valid"

-Dave Balter, Flipside

"Bitcoin is an educator, and it challenges our existing understanding of what money is and what it could be"

-Juri Bulovic, Fidelity Center for Applied Technology

'North Star' of Blockchain Ecosystem

"Bitcoin is the enabler of everything we've seen after Bitcoin"

-Itay Maling, Curv

"I think Bitcoin is the catalyst to create this new crypto economy"

-Brett Tejpaul, Coinbase

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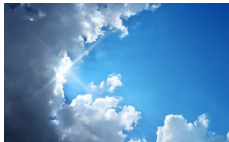
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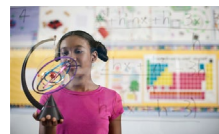
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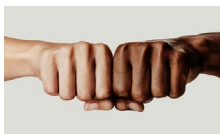
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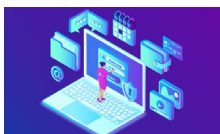
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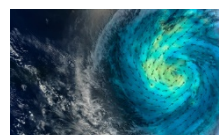
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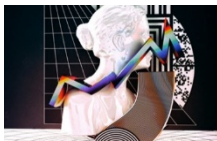
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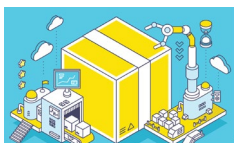
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Trading as an almost exclusively retail asset class before 2017, interest in Bitcoin among institutional investors has grown substantially. / **As crypto business models mature and institutional demand increases, existing entities are revamping their offerings and new entrants are emerging to provide enhanced data and exchange, trading, and custody services for institutional investors.**



CURRENCY

Views on Bitcoin have evolved from focusing only on its potential as a payment system, to its ability to store value and protect purchasing power in uncertain times, to its value as a digitally scarce commodity analogous to digital gold for investors. / **As its global reach continues to expand, Bitcoin's borderless design and other features may position it to become an international trade currency in the future.**

