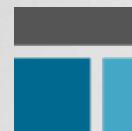


Digital Assets 101

Frequently Asked Questions

Last updated: March 2022



TIEDEMANN
—ADVISORS—

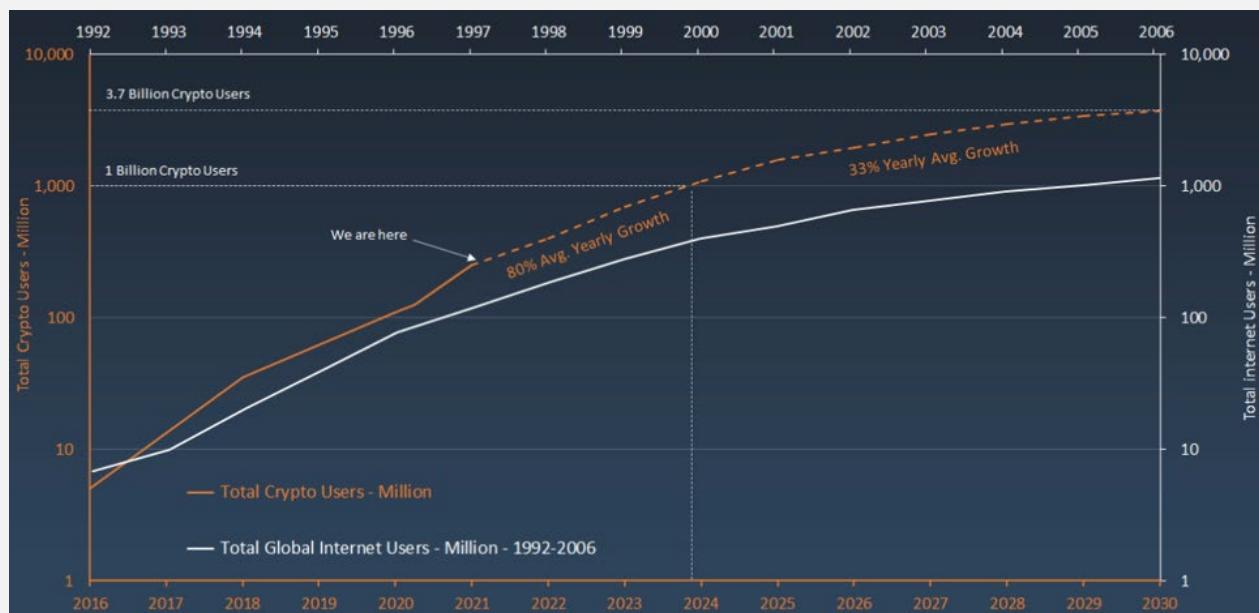
EXECUTIVE SUMMARY

Blockchain technology is still in its early stages of development, but it has the potential to be a transformative technological innovation.

Computing breakthroughs generally occur every 10-15 years. The mechanized calculators of World War II gave way to mainframes, followed by mini-computers, PCs, the internet, and now smartphones. With each new computing breakthrough came a wave of new applications, many of which were previously unimaginable. For example, smartphones with GPS and cameras enabled applications like Uber/Lyft, Instagram, and Google Maps. We can think of blockchain technology as a fundamental computing innovation that – like the smartphone – could lay the groundwork for a wide range of yet to be imagined applications.

While there are many ways to describe blockchain technology, it is most analogous to a global computer. This global computer allows digital information to be recorded and distributed, but not edited. Its key function is that it is “trustless” – users who do not know or trust each other and who have no legally binding agreements with each other, can interact to verify transactions over the Internet without the need for centralized third parties. Because most of the systems we rely on today are centralized, blockchain could transform many areas of the economy.

Technology Adoption Curve – Log Scale



Source: Crypto.com – World Bank – Global Macro Investor



To date, blockchain use cases have come in distinct waves. The first and best-known case of blockchain technology was Bitcoin, a single purpose blockchain meant to create a digital alternative to fiat currency. After Bitcoin, Ethereum was created as a generalizable blockchain that has primarily been focused on decentralizing financial services. Going forward, we expect blockchain technology to be applied to an ever-expanding set of use cases. For example, there is increasing development activity around other forms of digital assets that can be created, stored, and traded on a blockchain (photos, emails, digital files, etc.).

However, as with every novel technology, there are challenges to mainstream adoption. For example, scalability and regulatory uncertainty have made it difficult for blockchains to displace centralized incumbents. Similarly, governments are exploring their own digital currencies that could compete with (or complement) certain blockchains, like Bitcoin.

This FAQ is designed to help readers navigate the blockchain ecosystem, providing a brief introduction to how blockchain technology works, its potential applications, its potential risks, and pathways for investments. At the end of the document, we discuss Tiedemann's approach to investing in blockchain technology and current research priorities, as well as environmental, social and governance considerations.

In this FAQ, we review the following:

- + [What is blockchain and how are digital assets related?](#)
- + [What is Bitcoin and how does it impact fiat currencies?](#)
- + [What is Ethereum and decentralized finance?](#)
- + [What are future applications?](#)
- + [What are the risks and challenges around blockchain?](#)
- + [What are central bank digital currencies and how are they different from cryptocurrencies?](#)
- + [How does Tiedemann approach investing in blockchain technology?](#)
- + [ESG considerations](#)



WHAT IS BLOCKCHAIN TECHNOLOGY

What is Blockchain?

Blockchain is a technological innovation allowing digital information to be recorded and distributed, but not edited. Blockchain is enabled by software developed on top of a few sets of common language referred to as protocols. It was conceived in the early 1990s but the first real world application was not developed until nearly two decades later, with the launch of Bitcoin protocol in 2009. Although the technology may seem difficult to understand, a blockchain is most easily described as a database that stores data in blocks. Once a block of data is filled it is chained together with other blocks in chronological order.

Today, Blockchain has many uses, but it is most commonly used as a ledger for transactions. A key function of any blockchain is that it allows users to trust the outputs of the system without trusting any actor within it. Users who do not know or trust each other and who have no legally binding agreements with each other, can interact to verify transactions over the Internet without the need for trusted third parties like banks or clearing institutions. The transactions that are verified by a Blockchain can be anything from confirming a Bitcoin token has not previously been spent elsewhere (the crypto currency application) to confirming that the conditions of a specific contract between two parties have been satisfied (the smart contract application).

How are Digital Assets like Bitcoin and Blockchain Technology Related?

Bitcoin and other digital assets (Ethereum, Dogecoin, Stablecoins, etc.) use the technology to create their database or as many refer to it, their "digital ledger". Blockchain technology enables the creation of these digital assets or "crypto currencies," but it also has other applications within the financial industry and others which we explore in more detail later in this document.

WHAT IS BITCOIN & FIAT CURRENCY

What is Bitcoin?

Created in 2008, Bitcoin is the first blockchain and was designed to perform financial transactions without any centralized authority. In contrast to traditional payment networks, like Visa or Mastercard, Bitcoin is not run by a single entity but is instead run by a decentralized global network of computers that keep track of all Bitcoin transactions. In return for processing transactions on the Bitcoin blockchain, network participants receive the blockchain's native cryptocurrency / coin, which is also called Bitcoin (or BTC). According to Bitcoin's code, there will only ever be 21 million BTCs in existence; 18.5 million have already been distributed to network



participants and the remaining 2.5 million will be distributed by 2140. Because supply is limited, some view BTC as “digital gold” that can provide an alternative to fiat currency.

What is a fiat currency?

For most of human history, people have mainly transacted in currencies backed by commodities such as silver or gold. Our current fiat currency system—where money is backed by the full faith and credit of the issuing government rather than by a claim on a hard asset—did not come fully into existence until 1971, when President Nixon cancelled the convertibility of the U.S. dollar into gold.

The value of fiat money depends on people’s trust in the issuing government, which controls the money supply. There have been many instances in which central banks have grossly mismanaged money supply, leading to hyperinflation and severe declines in the purchasing power of fiat money. This is commonly referred to as currency debasement. Even in less extreme scenarios, fiat currencies have gradually lost purchasing power over time as central banks manage their money supplies to achieve moderate inflation.

How have investors historically hedged against fiat currency debasement?

To protect against these risks, many individual and institutional investors hold alternative currencies or “anti-fiat currencies”—quasi-monetary assets that conserve purchasing power and appreciate relative to fiat money in periods when confidence in central banks declines. The most widely used anti-fiat currency is gold, which benefits from its limited supply and thousands of years of use as money. Over very long periods, gold has served as an effective store of value and as a hedge against excessive money-printing, which is why many individual and institutional investors hold strategic allocations to gold.

Why do some investors consider digital assets like Bitcoin an alternative store of value to fiat currencies?

Some digital assets have attributes which could allow them to challenge gold as anti-fiat currencies/stores of value. The leading contender is Bitcoin, which is viewed by many as an attractive store of value because of its constrained supply. When Bitcoin was created, a condition was built into its source code that set a hard cap of 21 million on the number of Bitcoins that can ever be minted. There are currently 18.7 million units of Bitcoin in existence, and this supply will grow at a declining rate over the next few decades. The absolute limit on Bitcoin supply and its predictable growth are key features of Bitcoin that distinguish it from other cryptocurrencies, many of which do not have supply limits.



Compared to gold, Bitcoin has additional advantages as it can be easily stored and transferred around the world. Compared to other cryptocurrencies, Bitcoin benefits not only from its limited supply but also from its longer history, broad base of holders and larger market value. More users make a currency more useful, and a longer history confers the trust that is essential for a currency to be widely accepted.

What are the primary reasons Bitcoin may not become a widely accepted store of value?

Bitcoin presents a number of disadvantages that call into question its ability to become a widely accepted store of value in investment portfolios. These include:

Competition – Digital assets are still in the early stages of development and adoption, and it remains to be seen whether Bitcoin will be displaced from its role as the pre-eminent anti-fiat digital currency by other digital assets with improved functionality. It is worth considering that gold gained its role as the leading commodity currency over thousands of years. There are already signs that Bitcoin faces challenges from digital assets launched by central banks, as well as from the Ethereum network, which is taking steps to address excessive energy consumption and high transaction costs through changes to the consensus mechanisms used to verify new transactions. Moreover, the proliferation of new cryptocurrencies in recent years indicates that the supply of digital assets is far from finite.

Price volatility – Bitcoin's price has generally been five to ten times more volatile than the gold price over the past several years, with multiple episodes in which prices fell by 50% or more. There is no clear evidence that this volatility has subsided as Bitcoin's user base has broadened. It is difficult to make the case that an asset is a reliable store of value when its price is susceptible to such large fluctuations.

Energy/resource consumption – A central feature of the Bitcoin blockchain is computational intensity. To mint a new coin or verify a new transaction, Bitcoin "miners" compete to solve highly complex math problems for which they are rewarded with coins. Bitcoin mining operations typically require dedicated warehouses with large numbers of specialized computers linked to each other in a high-energy intensive process. It is estimated that Bitcoin's annual electricity consumption now exceeds that of Pakistan, a country of over 200 million people. Bitcoin mining has a particularly severe environmental impact because a large percentage of global Bitcoin mining takes place in China, where electricity is primarily generated with coal.

Use in illicit activities – Bitcoin's ability to facilitate payments without financial intermediaries can be an attractive characteristic in some cases, but it also makes the technology attractive to those seeking to sell illegal goods and services, launder money or claim ransoms for cybercrimes. It has



been estimated that 45% or more of Bitcoin transactions are made for illicit activities (Chainalysis, Foley/Karlsen/Putnins paper quoted in WSJ). In recent high profile ransomware attacks on pipeline operator Colonial Pipeline and meatpacker JBS, criminals demanded payment in Bitcoin. Incidents such as these have drawn increased attention from law enforcement and could over time result in greater restrictions and/or reporting requirements on payments with digital assets.

Regulatory threats – Energy intensity and use in crime are just two factors that could cause governments to regulate Bitcoin and other digital assets more heavily. Governments have a strong interest in preserving the fiat money system. Fiat currencies give central banks the power to set interest rates and provide liquidity backstops to the financial sector. Governments also benefit from “seigniorage revenue,” which arises from the ability of the Treasury to create new money and use it to purchase goods and services. The widespread adoption of decentralized digital currencies like Bitcoin could threaten these powers. It is no surprise that in countries, such as China, governments have taken steps to crack down on decentralized digital currencies such as Bitcoin while seeking to displace them with their own centralized digital currencies.

ETHEREUM & DECENTRALIZED FINANCE APPLICATIONS

What is Ethereum?

Ethereum was launched in 2014 as a generalizable blockchain that can be used by developers for almost any purpose. While the Bitcoin blockchain is a single use blockchain focused on creating a digital currency for decentralized transactions, Ethereum can be adapted for multiple uses. To date, the Ethereum blockchain has primarily been used to create decentralized finance (DeFi) services that could ultimately replace centralized incumbents in the financial ecosystem.

What is Decentralized Finance?

The ability to create a trusted, verified register of transactions without a central authority is enabling the concept of Decentralized Finance (DeFi). DeFi is enabled by Blockchain technology and built on protocols such as Ethereum. Ethereum is the foundational protocol for a range of decentralized applications (Dapps). Ethereum protocol enables an open source, distributed computing platform and importantly, the creation of smart contracts. The Ethereum protocol has emerged as the industry standard on which to develop smart contracts. Dapps are the face of DeFi, while Smart Contracts are the foundational layer of Defi. Smart Contracts facilitate, verify, or enforce the performance of an agreement automatically, without the need for any external verification process. Today, DeFi applications fall into several categories designed to mimic real



world financial markets that currently require some central authority to authenticate information and transactions – e.g., custodians, exchanges, payments, lenders, insurance, etc.

What are the potential investment implications of Decentralized Finance?

The potential investment implications within these series of DeFi concepts and protocols are enormous.

- The Ether crypto currency is the most discrete way to invest in DeFi. To use decentralized applications (Dapps) based on Ethereum protocol smart contracts users need specific tokens that work within the Ethereum system. These Ethereum tokens are called Ether (ETH), which is a crypto currency. The demand for using the Ethereum protocol for DeFi, Dapps, and other smart contracts drives the value of ETH tokens. The emergence of DeFi dapps built on Ethereum create an opportunity to invest in ETH tokens as a way to participate in the value creation within this system.
- The larger investment opportunity is likely beyond the ETH crypto currency. There are billions of dollars of market value tied up in businesses that are currently enabling financial transactions from custodians to banks, to foreign exchange platforms to insurance companies and billions of dollars spent annually on these services. DeFi applications seek to displace the businesses that use legacy systems to verify transactions, enforce contracts and remit payments for insurance settlements. This market value and annual spending is largely up for grabs.
- The emergence of DeFi is very early and has a long way to go before becoming a mainstream threat to these legacy institutions, nonetheless, Tiedemann is keeping a keen eye on the emergence of these new business models and related value creation potential.

DIGITAL ASSETS & FUTURE BLOCKCHAIN APPLICATIONS

What is a digital asset?

In the most basic terms, a digital asset is an intangible asset that is created, stored, and/or traded in a digital format. Initially this was anything from photos, emails, digital files, etc. However, with the development of distributed ledger blockchain technology came a unique subclass of "crypto" digital assets (most commonly used today are cryptocurrencies and tokens). Crypto assets utilize an advanced encryption technique enabled by blockchain technology to assure the authenticity of the assets and eradicate the possibility of counterfeit or illegitimate crypto assets being created and traded.



Stablecoins

Stablecoins (as indicated by the name) are meant to be more stable than other volatile cryptocurrencies by tying (or pegging) their value to a certain asset (e.g., fiat currencies, gold, other cryptocurrencies). Theoretically, the asset that backs or is tied to the stablecoin is held in reserve and can be exchanged unit-for-unit. The most common stablecoins are backed by a major currency (USD, Euro, Yuan, etc.) or basket of currencies. Thus, they are only as "stable" as the assets they are tied to. The most commonly known stablecoins are as follows:

- **Tether** is one of the oldest stablecoins, launched in 2014, with the largest market cap of any stablecoin so far. It is primarily used as an intermediary "currency" for foreign currency exchanges, providing arbitrage opportunities as well.
- **Dai**, developed in 2015, is pegged to the USD and backed by Ether (as it was created on the Ethereum blockchain network). This was built on the MakerDAO protocol on top of the Ethereum blockchain and is meant to act as a stable, decentralized currency without central bank authority oversight.
- **Diem (formerly known as Libra)** was announced by Facebook in 2020. While currency and network still do not exist today, it importantly inspires many other digital assets given Facebook's multinational presence and billions of users across their platform.

Tokens

Tokens (or Crypto Tokens) are similar to cryptocurrencies as they are another form of a unit of value developed via blockchain networks but are unique in that they are created by platforms that build on top of blockchain networks, the Ethereum blockchain network being the most commonly used today. For context, Ether is the cryptocurrency native to the Ethereum network while tokens are built on top of the network with different and unique characteristics. Other blockchains can certainly implement their own versions of tokens but the Ethereum blockchain is the most widely used today. While crypto tokens, like cryptocurrency, can hold value and be exchanged, they can also be designed to represent physical assets, traditional digital assets, or a certain utility or service. For instance, there are crypto tokens that represent tangible assets such as real estate and art or even sports highlights, as well as intangible assets such as processing power or data storage space.

Non-fungible Tokens (NFTs)

Non-fungible Tokens (NFTs) are individually unique and cannot be interchanged with other similar tokens. Unlike Bitcoin or Ether which are fungible and each coin can be exchanged for another coin of the exact same value, NFTs are each unique (like trading cards). NFTs can be



created for anything digital (e.g., music, video clips, art, images). While there can be many copies made of digital assets, the blockchain network enables there to be only a single NFT for a certain asset, similar to replicas of a painting where there can only be one owner of the original. Many people believe that NFTs will be the future of art collecting (or trading cards, sports memorabilia, etc.) while others believe they are a fad because they are one of the main items currently that can be widely purchased with cryptocurrencies.

Creator coins

The blockchain network allows for the development of other cryptocurrencies in communities and networks. Another example is creator coins (for example, Rally) where creators (artists, musicians, sports teams, content creators, etc.) can launch their own branded cryptocurrency. These cryptocurrencies can be purchased and sold or exchanged for unique items such as backstage passes or signed merchandise. Creators can reward their most loyal fans with additional coins or access to exclusive content or goods. It is a new way for “creators” to interact with their fans and monetize their popularity and influence.

RISKS & CHALLENGES

Despite the obvious potential of blockchain technology, there remain a number of risks and challenges to mainstream adoption that investors should be aware of before deploying capital to opportunities in this space. Some of these risks—e.g., excessive energy consumption, regulatory/legal threats—are addressed in our discussion of Bitcoin above. In this section we highlight some additional questions that investors should consider.

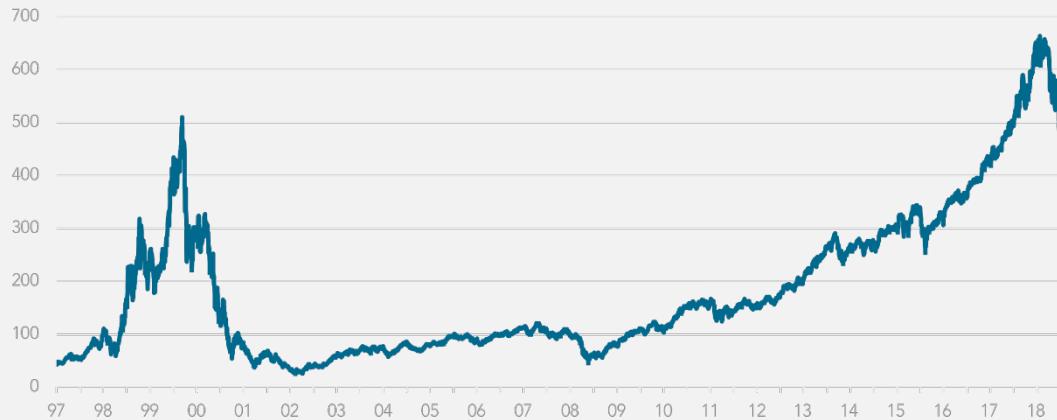
How have early investors in prior technological advances fared?

Revolutionary technologies do not necessarily produce high returns for investors. Like the Internet, Blockchain technology could prove to be a computing breakthrough that transforms the global economy and underpins massive value creation for a new group of businesses. However, history shows that investing in the most successful technological advances can lead to poor results when excitement about the future causes investors to pay unsustainably high valuations.

The experience of early investors in Internet stocks should serve as a cautionary tale. The Dow Jones Internet index rallied 12x between 1997 and March 2000. It surrendered all of these gains as the tech stock bubble burst and took over a decade and a half to recover its prior peak. Even investors who bought Internet stocks well before the March 2000 peak suffered severe declines which extended for several years.



Dow Jones Internet Index (1997-2018)



Source: Bloomberg

Today, there are signs of speculative excess in digital currency markets that are reminiscent of the technology bubble of the late 1990s. Examples include the parabolic gains in parody coins like Dogecoin and Shiba Inu (which as of July 2021 still have a combined market value of nearly \$1.5 billion) as well as the significant premiums traders are willing to pay for products that allow them to make highly leveraged bets on digital tokens. Despite the relatively short history of digital asset investing, we have already seen speculative bubbles burst. The boom-and-bust cycle in Initial Coin Offerings in 2017-2018 is an example.

Is Decentralized Finance being used for real world applications that replace traditional financial intermediaries or is it still primarily a tool for trading digital assets against each other?

Proponents of Decentralized Finance point to rapid growth in the “total value locked” in smart contracts as evidence of accelerating adoption of blockchain technology by the financial system. Yet, so far, the vast majority of the activity facilitated by smart contracts involves trading digital assets against each other or borrowing against digital assets to establish a levered position. The tools of decentralized finance have still not been widely applied to off-blockchain financial services.



What are the main challenges to scaling Decentralized Finance and applying it to off-blockchain uses like banking, insurance, and exchanges?

Two key challenges are: (1) building the infrastructure that delivers information from the outside world to the blockchain; and (2) increasing transaction speed and throughput so that blockchains can handle the tens of thousands of transactions per second that centralized payment networks currently process.

Developing the infrastructure to connect blockchains with the outside world is necessary because blockchains are isolated networks like computers without an Internet connection. For smart contracts to realize the full range of potential use cases, they require middleware that connects the blockchain to off-chain systems that provide asset price data, e-signatures, access to traditional payment networks, etc. For example, a trade finance smart contract needs to interact with trade documents and digital signatures verifying delivery before releasing payments. Solving these challenges—known in cryptography circles as the Oracle Problem—poses tradeoffs that could dilute some of the benefits of blockchain technology because it introduces problems such as data quality, reliance on centralized sources and increased vulnerability to external manipulation. This is one of the most active areas of innovation in the digital asset space, but one which is still in its infancy.

Increasing transaction speed and throughput are also critical to scaling Decentralized Finance and making it more competitive with incumbent centralized systems. The consensus mechanisms used by blockchains such as Bitcoin and Ethereum to verify transactions are highly secure, but they result in long settlement times and high fees. There are a variety of projects underway to increase the speed and throughput of transaction processing on Bitcoin and Ethereum, as well as rival blockchains such as Solana and Cardano that use alternative verification mechanisms while seeking to maintain security.

Should I invest in digital asset savings accounts offering high single digit APYs? Where do those yields come from?

Many proponents of digital assets point to the high Annual Percentage Yields (APYs) available to investors. It is important to understand where these “yields” are coming from, what risks must be taken to earn them, and how sustainable they are likely to be.

Sam Bankman-Fried, founder of digital asset exchange FTX, explains why yields on digital assets spiked in 2020 and early 2021:



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“we were in a place, for a good solid year, where at least people trading crypto were bullish on crypto...Collectively, the people in crypto had X dollars; they wanted to buy 2X worth of crypto...It's hard to get dollars into crypto, and the big banks aren't really lending that much ...And you just see people bidding up any ways they can to get longer... You see people bidding up futures. They're trading at premiums...You then see people on spot markets borrowing UST [Note: UST is a stablecoin pegged to the US dollar], using it to buy Bitcoin or other crypto, and so now, all of a sudden, UST's interest rate starts to blow up...And it just seeps into everything that has an interest rate component to its pricing...But they tend to line up around what the industry's net bullish or bearishness is.”

High yields on digital assets have been driven by an imbalance between the very strong demand for levered digital asset exposure and limited supply of this leverage within the digital asset ecosystem. Over time, this imbalance is likely to subside—either because speculative demand for digital assets declines or because new sources of leverage appear within the system. Both of these factors have likely contributed to a decline in digital asset yields from their peak in early Q2 2021.

Investors attracted to the high APYs offered on digital asset savings accounts should be aware that these accounts are not subject to FDIC or SIPC protections. Digital asset savings account providers earn money by taking deposits and lending digital assets and fiat currency to their users. While most of these platforms mandate overcollateralization when lending assets, the prices of digital assets are so volatile that even overcollateralized loans could suffer credit losses in the event of sharp declines in digital asset prices. Depositors are exposed to this credit risk and could face principal impairment if the provider goes bankrupt.

What kinds of protections exist for investors who participate directly in Digital Asset markets?

Investors who seek to hold more established digital assets such as Bitcoin, Ethereum and some of the institutionally backed stablecoins have access to high quality custody solutions, some of which are described below in the Glossary section of this FAQ. Those who want to participate in markets for other digital assets should be aware that most of these still-nascent markets have few, if any, of the regulatory protections of centralized financial markets. Even experienced investors in digital asset markets have been victims of hacks, poorly written code, and outright



scams. The recent [losses suffered by internet entrepreneur Mark Cuban](#) on a stablecoin project called Iron Finance are a case in point.

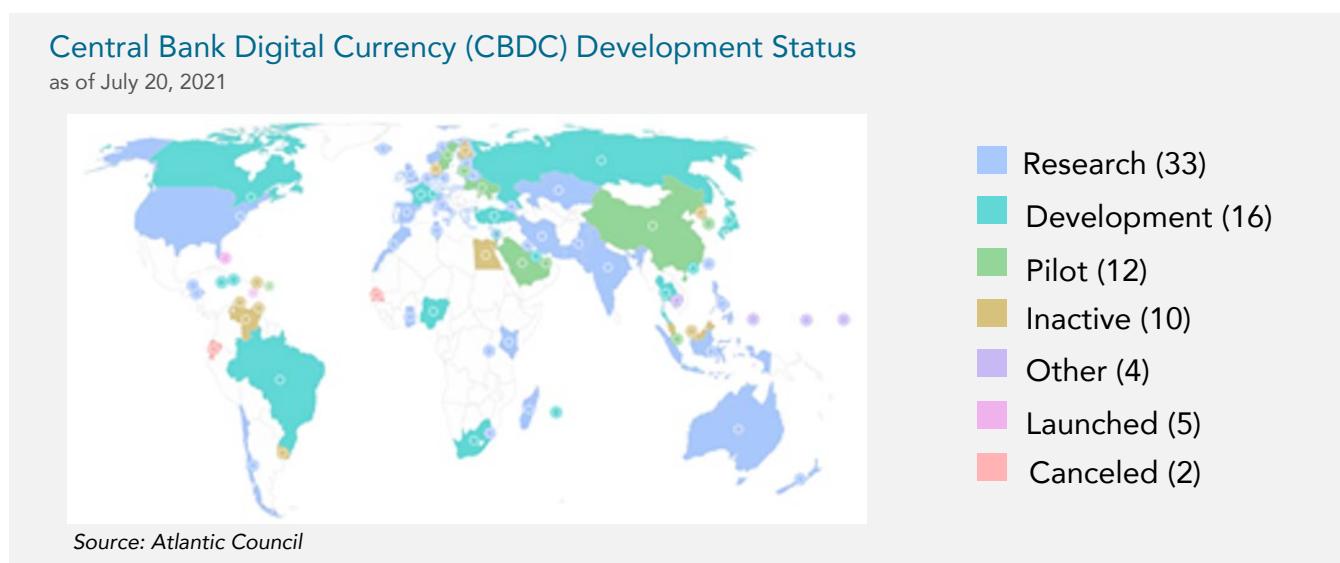
As one might expect of a largely unregulated market that is receiving billions of dollars of investor inflows, digital asset markets have attracted malicious actors. While decentralized systems have many benefits, they have important drawbacks when it comes to fraud including the anonymity afforded to perpetrators and limited recourse for victims of scams. "Rug pulls" are an increasingly common type of scam in which the fraudster mints a new token and uses social media platforms like Twitter and Telegram promoter to promote it, then creates a "liquidity pool" for the new token via a smart contract on an automated market making protocol like Uniswap that allows individuals to swap a more established digital asset like Ether or Bitcoin for the newly minted token. At this point the fraudster drains the liquidity pool of the valuable asset, leaving the other participants in the liquidity pool with nothing but a worthless token.

While these types of scams are generally small, they are proliferating. According to Chainalysis, over \$2.6 billion has been taken fraudulently from investors in 2021, without counting a \$3.6 billion Bitcoin Ponzi scheme in South Africa that recently came to light. Governments face significant challenges in prosecuting or regulating this activity, much of which takes place on decentralized exchanges running on open-source code that cannot easily be shut down.

CENTRAL BANK DIGITAL CURRENCIES

What are Central Bank Digital Currencies?

A Central Bank Digital Currency (CBDC) is the digital form of a country's fiat currency that is also a claim on the central bank. Instead of printing money, the central bank issues electronic coins or accounts backed by the full faith and credit of the government.



Who is responsible for overseeing CBDCs? How is this different from online banking/credit cards and other decentralized digital currencies like Bitcoin?

CBDCs are the liability of the central bank, which means the government must maintain reserves and deposits to back it up, rather than a private bank. There are already thousands of virtual currencies, commonly called cryptocurrencies. These could be centralized, but they are not from the government – think of Facebook’s Diem. The fully decentralized version is Bitcoin and its competitors. Cryptocurrencies run on distributed-ledger technology, meaning that multiple devices all over the world are constantly verifying the accuracy, not one central hub.

Why would a government invest in digital currencies?

There are a few reasons why a government would invest in digital currencies primarily depending on the economic situation within a country. According to the IMF (International Monetary Fund) reasons include: The cost of managing and transferring cash is high and this technology can reduce expenses; financial inclusion means those who are unbanked can get easier and safer access to money on their phone; private companies need competition so they meet transparency standards and limit illicit activity; monetary policy can flow more quickly and seamlessly through CBDCs.

What are the risks associated with digital currencies?

There are several, and each one needs careful consideration before a country launches a CBDC: Citizens could pull too much money out of banks at once and purchase CBDCs, triggering a run on banks; centralizing a system designed to be private through the government may produce a backlash among users and create cybersecurity risks; our regulatory processes are not updated to deal with the new forms of money.

What are the chances of the U.S. creating a digital dollar and why would it be created?

The United States has begun its own process to develop a digital currency, with Jerome Powell, the Federal Reserve (FED) president, treating the digital dollar as a “high priority project,” though it has not yet been implemented at any scale. When it comes to domestic issues, the Coronavirus pandemic has highlighted the need for a digital currency. To this point, Janet Yellen, Secretary of the Treasury, has said that “It makes sense for central banks to look at it [CBDC].” The launch of a U.S. digital dollar is being considered by the Federal Reserve. In January 2022, the Fed released a [paper on this topic](#). The four key issues discussed in the paper are (1) the growing role of digital private money, (2) the migration to digital payments, (3) plans for the use of foreign CBDCs in cross-border payments, and (4) concerns about financial exclusion—are sharpening the U.S. focus on CBDCs and development of a digital dollar. The White House, U.S.



Treasury, and Fed are all studying the potential rollout of a digital dollar. Pilot projects are being run by the digital dollar project in key U.S. cities and Congress is also studying this issue.

In constructing a digital currency platform, concepts such as preserving financial stability, rule of law and privacy are policy considerations which can be built to varying degrees into the digital dollar platform, its use and oversight. In a burgeoning atmosphere of cryptocurrencies and stable coins, a digital dollar offers stability by reducing market manipulation risk, counterparty risk, fraud and offering the consumer protections attached to the U.S. dollar.

What are the future benefits provided by a digital dollar?

- The ability through its primacy, regulatory capacity and, perhaps, through additional capabilities within a digital dollar platform, to reassert Western standards and values such as rule of law and reasonable privacy.
- Greater efficiencies from faster transactions, reduced costs, and faster cross border transactions.
- Enables the ability to provide greater financial inclusion and the development of more effective economic policy.
- Greater transparency and accountability.
- The potential to facilitate economic growth.

Why did China create a digital yuan? What are the geopolitical implications for the U.S.?

Over the course of the past six years, China has been in the developmental stages of rolling out their own automated payment system called DCEP, or Digital Currency Electronic Payment, which was rolled out in early 2021. In 2014, The Central Bank of China assembled a special task force to conduct research on digital currencies and established the Research Institute of Digital Currency. With its recent test pilot launching a digital currency, China seeks to promote the internationalization of the renminbi, which has largely stalled since 2015. China hopes that the digital renminbi can be used in cross border payments without going through banking intermediaries, effectively avoiding the U.S. financial system and leverage of U.S. sanctions. While the digital yuan on its own will not displace the United States in the near term, its unilateral development by China will create enormous possibilities for extending influence abroad. While it does not signal the abrupt end of U.S. global primacy if China is able to successfully implement a CBDC domestically and abroad, their continued leadership on a diverse set of international issues certainly builds their momentum for such an eventual shift.



TIEDEMANN'S APPROACH TO INVESTING IN BLOCKCHAIN TECHNOLOGY

How can one invest in blockchain technology?

The technology with its many potential applications is still in its very early stages of development, but it has the potential to be one of the most important and disruptive technological innovations of our lifetime. Digital assets such as crypto currencies are only a subset of the investable ecosystem building around this technology. Asset managers in private and public markets offer investable solutions and major technology firms (Amazon, Google, Facebook, Visa, etc.) are developing their own applications.

Does Tiedemann have dedicated investments in digital assets today?

Currently, Tiedemann portfolios gain exposure to digital assets and the associated ecosystem of companies via investments in venture capital, public and private equity managers, and hedge fund managers. Since digital assets are essentially investments in new forms of technology, we believe technology focused managers active in the private and public markets are best equipped to evaluate them. We do not currently have investments in funds or vehicles dedicated to digital assets, although we are currently evaluating multiple ways to participate in the space, as described in more detail below.

While we do not yet have a dedicated investment in the sector, certain Tiedemann managers focused on the technology sector have made multiple investments in the digital asset space. For example, one manager has invested over \$500mm in private businesses involved in crypto exchanges, payments and infrastructure. We also have managers invested directly in crypto currencies like Ethereum and Bitcoin, as well as managers investing long and short in the equity and convertible debt of public companies involved in the ecosystem (Coinbase, Microstrategy, etc.). Furthermore, we are actively invested via private funds and co-investments in the "Deep Tech" space, meaning software and hardware manufacturers developing next-generation technologies. Many of those technologies are expected to find applications in the digital asset realm, thereby participating in the expected continued high growth in that segment. Finally, we are invested in private funds and co-investments in the sports and entertainment industry pursuing monetization strategies via digital assets such as NFTs (non-fungible tokens).

We expect our exposure to digital assets to increase as several of our hedge fund managers are exploring ways to increase their participation in this ecosystem, from evaluating potential arbitrage opportunities between the price of digital currencies across different exchanges, to lending capital collateralized with digital currency holdings.



How else are Tiedemann public equity portfolios exposed to the growth in digital assets?

Public companies in our equity portfolios are involved in the digital asset ecosystem, either by: 1) providing hardware and software solutions to companies in the space; 2) supplying blockchain technology development tools; or 3) via direct investments in digital assets.

Looking at the top-20 active equity holdings in a representative Tiedemann portfolio, we can see several companies that are currently participating in the digital asset space. Examples include Microsoft and Amazon, leading providers of cloud services that enable crypto exchanges and blockchain technologies like Ethereum; Visa and Mastercard, providers of digital currency payments and transactions; Google and Facebook, involved in many crypto-related ventures, including Facebook's development of stablecoin Diem; Fidelity National Information Service and Verisk, which offer security and risk analytics for transactions in the crypto space; and Softbank, which is invested in multiple portfolio companies in the digital asset ecosystem.

Importantly, while Tiedemann client portfolios participate in the ecosystem via the active weights described above, it is important to note that even passive investors in equities are exposed to the growth in the sector as well. The top 20 holdings in the S&P 1500 strategy many of our clients use for passive equity exposure also include Microsoft, Amazon, Google, Facebook, Visa and Mastercard, all mentioned previously; and those top 20 holdings also include Tesla, a digital owner and transactor (at least until recently); Apple, which provides crypto wallets through the App Store; Nvidia, a leading chip manufacturer for the Bitcoin mining industry; and Paypal, which facilitates digital currency payments.

What are Tiedemann's research priorities for potential investments within digital assets?

With the digital asset space maturing at a fast pace, our team has been evaluating multiple potential alternatives for our clients to participate more directly in the expected continued growth of the sector. In addition to the existing investments mentioned above, we are focusing on potential dedicated investment opportunities in the ecosystem, as well as evaluating different ways in which our clients can gain access to digital currencies in the most efficient and secure way possible.

As part of our efforts to identify attractive dedicated private opportunities, we have focused on two areas: venture capital funds investing in companies that provide infrastructure services (hardware and software) for players involved in the blockchain ecosystem; and other investment funds more focused on the fast-growing DeFi (Decentralized Finance) space.



Meanwhile, on behalf of clients interested in owning digital currencies directly, we can facilitate purchases of certain digital assets via SEC-approved custodial partners and continue to evaluate new custody partners to expand the number of available options by comparing the different alternatives across a number of dimensions including pricing, liquidity, and regulatory risk.

Does Tiedemann recommend a strategic allocation to Bitcoin?

At this point, Bitcoin is not part of our recommended portfolios. We recognize the potential for Bitcoin to act as a store of value in the future, competing with gold and other more traditional real assets that have played that role in our portfolios in the past. However, at present we still see significant risks associated with investing in Bitcoin, including competition from other digital currencies, an unsettled regulatory framework, energy consumption and climate related concerns, and limited proven and time-tested ways to directly own Bitcoin.

Until the space matures further, we expect to see continued high price volatility for Bitcoin, which detracts from its usefulness as a reserve of value. For the time being, our portfolios continue to utilize gold and other real assets (mainly companies involved in the commodity or real estate sectors) as their main stores of value, outside of fiat currencies. We do expect that a growing number of our technology focused investment managers and hedge funds will raise their level of investment in crypto currencies like Bitcoin as well as the digital asset ecosystem more broadly. These technology-focused investors in public and private markets are best suited to continue to evaluate new technologies in the digital assets ecosystem.

We recognize that digital assets like Bitcoin appeal to certain clients and the potential for further appreciation if adoption continues to grow. We will continue to educate interested clients and facilitate purchases in the most secure and cost-efficient manner.

ESG CONSIDERATIONS

What should investors consider when evaluating digital assets through an ESG lens?

Looking at digital assets with an environmental, social and governance (ESG) lens requires transparency and analysis around several important considerations in areas such as financial inclusion benefits and environmental impact. These trade-offs are dynamic, any initial analysis which states whether digital assets are “ESG-friendly” may not hold up to scrutiny in the future. The decentralized nature of the digital asset ecosystem requires those who evaluate the technology to also evaluate the behavior of the market participants who interact with the technology. The net positive or negative social impact of digital assets/ blockchain may be determined by whether the technologies are used to promote financial inclusion or to engage in fraud, or both. This makes analysis of any governance aspects challenging. Along the same lines,



future environmental impact will be determined by whether participants mine for tokens with renewable energy, whether proof-of-stake protocols are adopted, and whether blockchain is used to increase transparency around important issues such as greenhouse gas (GHG) emissions. The current and future benefits of digital assets and blockchain are very clear and powerful. In some cases, there may not be another viable solution to the problems that digital assets and blockchain help solve. The negative attributes of these technologies are currently a problem, but one which members of the digital asset and blockchain communities are actively working on solving.

What are the primary positive and negative ESG/Impact considerations associated with digital assets?

Positive Considerations:

- **Payments/ Store of Value:** Around the world 4.5 billion people live under authoritarian regimes and 1.5 billion people live in countries with double-digit or higher inflation rates. Many digital assets have volatile price patterns which may not make someone think of them as a store of value. That notwithstanding, digital assets can help protect against the reduction in fiat currency value from hyperinflation as we have seen in recent years in Lebanon, Zimbabwe, and Venezuela. They can help citizens get capital out of conflict zones and provide some financial stability to refugees.¹ Further, it is estimated that 1.7 billion people around the world are unbanked.² Digital assets that can be transferred across borders without a bank or other intermediary present huge opportunity for economic mobility for unbanked populations. Remittances are believed to have totaled over 20% of El Salvador's GDP in 2019, and this is significant part of their government's recent decision to embrace Bitcoin as legal tender. The President of El Salvador Nayib Bukele has stated the Bitcoin Law will allow residents to save up to \$400 million in commissions for sending and receiving remittances. El Salvador's experiment has received mixed reviews due to digital literacy challenges and cybersecurity challenges, but if successful it may serve as a model. In addition to improving the ability to move and store money, digital assets can be used to provide a gateway to additional financial services and credit access. Blockchain has the potential to do all of this in a censorship resistant manner, free from authoritarian control. Central banks are also recognizing the potential benefits for digital assets in the form of Central Bank Digital Currencies (CBDCs) to address financial inclusion. There are currently 80 CBDC pilot programs underway, given credence to the notion that a "digital wallet" in some form can help with safety, speed, and access for the unbanked and underbanked.³
- **Property Rights:** For many years, Peruvian economist Hernando DeSoto has made the case that limitations on land and title registries are a significant force holding back many developing economies. Without proof of ownership there are significant limitations on the



ability to transfer ownership of property or to borrow against an asset. This inhibits capital formation and economic growth, particularly for the lowest-income segments of the population who tend to participate most heavily in the informal economy. Blockchain's role as a decentralized ledger provides a potential solution and this is being tested in Estonia, the Republic of Georgia, and Peru.⁴

- **Traceability:** Blockchain has huge potential to help companies improve the social and environmental footprint of their supply chain. Stakeholders are beginning to demand that companies track their Scope 1, 2 and 3 emissions but few companies are set up to do this. Without an initial measurement, it will be challenging to decarbonize in a way that stakeholders find satisfactory. Instant authentication, immutable data records, and smart contracts are beginning to play a role for companies in their decarbonization efforts. Rocky Mountain Institute highlights the use of blockchain technology as one of its four pillars of climate intelligence ([RMI](#)).⁵
- **New Economic Organizations:** Blockchains have made new types of economic organizations possible in which participant users capture a significant portion of the value created due to decentralization. For example in the world of internet gaming, pay-to-win games (i.e., Candy Crush) and free-to-play games (i.e., Roblox) split revenue between corporations, developers, and app-stores. Blockchain allows for a different "play-to-earn" model in which players can earn tokens for playing games and supporting the ecosystem. In this model, the players (supported by non-profits linked to a protocol) can generate income through game play. The game Axie Infinity, built on the Ethereum network, became very popular as a way to generate cryptocurrency income in Venezuela and the Philippines over the past year.⁶
- **Artistic Expression:** Digital assets also have positive social value in the world of artistic expression. Non-Fungible-Tokens (NFTs), in particular, provide artists a new marketplace for digital artistic expression, and one in which they capture a significant portion of the value created. Through smart contracts embedded in NFTs, artists can ensure they receive a portion of profit from future resales thereby creating long term equity in their work. NFTs further benefit creators and collectors by improving transparency within the art world and by ensuring originality and authenticity. Combined sales for art and collectible NFTs have risen from \$340 million in 2020 to over \$9 billion in 2021, as 25-fold increase.

Negative Considerations:

- **Illicit Activities:** Digital assets have received some notoriety for their use in crime including scams, money laundering, ransomware, and trafficking. While these transactions get attention in the media, they are likely overhyped. Overall, the trend in percentage of



digital asset transactions linked to crime is down significantly. Recent analysis from Chainalysis suggests that 0.34% of digital asset transactions in 2020 were linked to illicit activities, down from 2% in 2019. While more than 50% of illicit activities were classified as scams, ransomware crimes rose in 2020 due to heightened security vulnerabilities arising from work-from-home situations.⁷ In addition, digital asset transactions provide law enforcement with ability to track transactions on the blockchain. This provides valuable information to investigators, far beyond what is possible with cash transactions. Regulators have been successful in tracking down and recovering digital assets obtained from illicit activities including those recently obtained through ransomware from the Colonial Pipeline hack.

- **Energy Usage:** Bitcoin in particular has received scrutiny for the energy usage associated with its “proof of work” protocol in which “miners” use increasing amounts of energy due to the computing power required for verification of transactions. Miners of Bitcoin (and other proof-of-work protocols) have incentive to use the cheapest sources of energy they can find. This has led them to regions in China in which hydro power is abundant during the rainy season (Sichuan and Yunnan) and where coal is abundant (Inner Mongolia and Xinjiang).⁸ China banned mining in these regions in May 2021, driven in part by a desire to be seen as a climate change leader. While energy usage remains a significant issue for Bitcoin and other proof-of-work protocols, it is far less of a problem for proof-of-stake protocols which do not require the significant processing power associated with mining. Solana, Cardano, and now Ethereum 2.0 are proof-of-stake protocols in which network participants stake their tokens for the opportunity to validate transactions in order to update the blockchain and earn rewards. This process does not have the heavy energy usage associated with duplication of computation in proof-of-work.
- **Surveillance:** Authoritarian regimes in countries like China, Russia, Iran, Turkey, and others are weaponizing central banks, and using digital assets to use it as a tool of surveillance. As with the case of other forms of technology, we expect investors in digital assets will need to consider whether their investments support decentralization or whether they support control and surveillance. While some of the technology underlying distinct projects such as the digital yuan and web 3.0 may be similar, the goals are far different. We don't believe it is accurate to broadly describe digital assets as tools for an authoritarian surveillance; in many cases they are the opposite.

How are these technologies adapting to ESG considerations in real time?

Participants in the digital asset community have been right to worry about negative ESG attributes in areas such as use in illicit activities and energy usage. While these concerns may remain for many years, market participants appear to be moving the industry in the right direction and at a fast pace relative to other industries. Given the positive benefits of digital



assets described above, we believe the ESG case for crypto and blockchain is strong. Within the world of digital assets and blockchain, networks which are explicitly focused on harm reduction (e.g., Ethereum's pending adoption of proof-of-stake) and enhancing social and environmental outcomes (e.g., blockchain uses for the traceability of carbon emissions) should be a priority for investors.

While the energy consumption related to Bitcoin mining and proof-of-work protocols more generally is high, the industry appears to be making attempts to reduce the associated carbon footprint of mining. The industry is looking into ways to use Bitcoin mining to help renewable power producers monetize excess capacity during times in which energy supply exceeds energy demand. This provides an alternative to battery storage and this monetization may ultimately help with the economics of the buildout of new renewable power generation assets. In addition, the environmental challenges associated with proof-of work protocols are not present with proof-of-stake protocols. As part of its ETH 2.0 upgrade, the Ethereum network plans to move to proof-of stake protocol in 2022, a move which is expected to cut its energy consumption by 99%. This will be a closely watched moment for the crypto industry which could lead to a dramatically lower carbon footprint in the future.⁹

How will Tiedemann Advisors evaluate the digital asset space from an ESG perspective moving forward?

Given our view that the main benefits are Social, the largest challenge is the high carbon intensity of certain blockchain technologies (e.g., proof-of-work blockchains like Bitcoin). On the Environmental side, we are looking to partner with groups that appropriately address the high carbon intensity concern. For example, a venture capital firm with whom we recently invested told us this: "The fund will be primarily focused on investing in smart contract platforms and applications being built on top of them. These protocols tend to leverage proof-of-stake technology which has minimal environmental impact. In the case that the fund invests in any proof-of-work protocols we will take the necessary steps to offset our carbon footprint through carbon credits." We believe this is a thoughtful and appropriate perspective. In addition, we will continue to track use cases for digital assets which align with environmental goals such as the use of blockchain technology for transparent tracking of methane emissions. As the market evolves, we hope to see strategies which are dedicated to applying blockchain technology to environmental challenges.

On the Social side, we are looking to invest in solutions which enable societal improvement in areas such as financial inclusion, property rights, traceability, artistic expression, and creation of new economic organizations such as play to earn. For example, Sempo is a company with the mission of connecting financially isolated communities with each other and the global economy through digital cash transfer. In addition to the tokens and companies which create these



solutions, we are also interested in the infrastructure layer which enables them. ConsenSys is a company which enables Ethereum application development. In 2019, Oxfam worked with Sempo and ConsenSys to pilot *Project Unblocked Cash*: a cash and voucher assistance program built on the Ethereum blockchain. The program, trialed in Vanuatu, connected disaster victims with “cash” aid faster while providing real-time visibility into the flow of funds. More recently, Ava Labs, creator of the Avalanche network and the AVAX token, announced its partnership with Deloitte that will help state and local government officials simplify and streamline disaster reimbursement applications and payment processing.

On the **Governance** side, decentralization of the internet through Web 3.0, Distributed Autonomous Organizations, and the ownership economy through NFTs all represent opportunities for novel governance structures and new ways to organize people economically. In theory, we should look for a high degree of decentralization to realize the full benefit of digital assets as censor-proof and autonomous stores of value. With that said, there can be a tension between the scalability of more centralized projects (e.g., Solano) and more maximally decentralized projects (e.g., Ethereum) because of the time and energy usage associated with a distributed voting process. There are concrete governance aspects to review for protocols, including legal compliance, investing in code auditors, creating good treasury controls, and ensuring that tokens do not appreciate to a point where smaller users are locked out. Part of our investment focus area should be maintenance of balance in governance decisions between financial investors, user communities, and other stakeholders.

1 <https://www.gsb.stanford.edu/sites/gsb/files/publication-pdf/study-blockchain-impact-moving-beyond-hype.pdf>

2 https://globalindex.worldbank.org/sites/globalindex/files/chapters/2017%20Finindex%20full%20report_chapter2.pdf

3 <https://www.atlanticcouncil.org/blogs/geotech-cues/central-bank-digital-currency-can-contribute-to-financial-inclusion-but-cannot-solve-its-root-causes/#financialinclusion>

4 <https://www.ild.org.pe/component/tags/tag/blockchain>

5 <https://rmi.org/how-digitally-native-ghg-tracking-can-drive-faster-climate-action/>

6 <https://www.notboring.co/p/infinity-revenue-infinity-possibilities>

7 <https://go.chainalysis.com/2021-Crypto-Crime-Report.html>

8 https://www.wsj.com/articles/cryptocurrency-companies-are-leaving-china-in-great-mining-migration-11629624602?mod=searchresults_pos4&page=1

9 <https://ethereum.org/en/eth2/beacon-chain/>



GLOSSARY

Digital Wallets

A digital wallet is a place that stores your digital currency and validates your transactions when you're using your cryptocurrency (i.e., Bitcoin). A wallet keeps secret information, called a private key or a seed, which is used to validate transactions and "sign" them so that your digital currency can be used to make purchases or exchanged for another asset. This prevents someone else from using your Bitcoin or the transaction being altered by a third party.

Bitcoin and cryptocurrency wallets are a place to store digital assets more securely. Having your crypto outside of the exchange and in your personal wallet ensures that only you have control over the private key to your funds. It also gives you the ability to store funds away from an exchange and avoid the risk of your exchange getting hacked and losing your funds. Some wallets have more features than others. Some are Bitcoin only and some offer the ability to store numerous types of altcoins. Some wallets also offer the ability to swap one token for another.

When it comes to choosing a wallet, there are a number of options. The first thing to understand about crypto wallets is the concept of [hot wallets](#) (online wallets) and [cold wallets](#) (paper or hardware wallets). These wallets are meant to be used for small amounts of cryptocurrency. You could liken a hot wallet to an online checking account. Conventional financial wisdom would say to hold only spending money in a checking account while the bulk of your money is in savings accounts or other investment accounts. The same could be said for hot wallets. Hot wallets encompass mobile, desktop, web, and most exchange custody wallets.

Exchanges

A cryptocurrency exchange, or a digital currency exchange (DCE), is a business that allows customers to trade [cryptocurrencies](#) or [digital currencies](#) for other assets, such as conventional [fiat money](#) or other digital currencies. Exchanges may accept credit card payments, wire transfers or other forms of payment in exchange for digital currencies or cryptocurrencies. A cryptocurrency exchange can be a [market maker](#) that typically takes the [bid–ask spreads](#) as a transaction commission for its service or, as a matching platform, simply charges fees.

The most popular exchanges in the United States include [Coinbase](#), [Kraken](#), [Gemini](#), and Binance U.S., to name a few. Each of these exchanges has grown significantly based on the value of cryptocurrency traded and in the number of features they offer.

Some brokerages which also focus on other assets such as stocks, like [Robinhood](#) and [eToro](#), let users purchase but not withdraw cryptocurrencies to cryptocurrency wallets.

It is also possible to buy Bitcoin through payment processors such as PayPal, Square and the Cash App.



There are varying fees for deposits to the exchanges via a bank account, debit, or credit card. For instance, Coinbase has a 1.49% fee for bank accounts, with a 3.99% fee for debit and credit cards. It is important to research the fees associated with each payment option to help choose an exchange or to choose which payment option works best for you. Exchanges also charge fees per transaction. This fee can either be a flat fee (if the trading amount is low) or a percentage of trading amount. Credit cards incur a processing fee in addition to the transaction fees.

Digital Asset Custodians

The main utility of cryptocurrency custody solutions lies in the safeguarding of cryptocurrency assets. [Private keys](#), which are used to conduct transactions or access crypto holdings, are a complex combination of alphanumerics. They are extremely difficult to remember and can be stolen or hacked. Online wallets are a potential solution, but they have also proven susceptible to hacks. The same is true of cryptocurrency exchanges.

A main reason for the existence of cryptocurrency custody solutions is regulation. According to [SEC regulation](#) promulgated as part of the Dodd Frank Act, institutional investors that have customer assets worth more \$150,000 are required to store the holdings with a "qualified custodian." Within the cryptocurrency ecosystem, very few mainstream banks offer custodian services. [Kingdom Trust](#), a Kentucky-based custodian, was the largest such service for cryptocurrencies until it was purchased by BitGo, a San Francisco-based startup. Put simply, cryptocurrency custody solutions are third party providers of storage and security services for cryptocurrencies. Their services are mainly aimed at institutional investors, such as hedge funds, corporations and financial institutions that hold large amounts of Bitcoin or other cryptocurrencies. The solutions generally incorporate a combination of hot storage, or crypto custody with connection to the Internet, and cold storage, or crypto custody that is disconnected from the Internet.

Due to recent regulatory developments and increased demand from customers, banks and other client firms may benefit from offering an integrated digital asset solution. Instead of committing the resources and time to build an in-house service, a sub-custody relationship could provide a superior alternative that allows providers to satisfy their clients' needs and get to market quickly without detracting from their core business priorities.

Tiedemann facilitates the relationships with Fidelity Digital Assets to offer a full-service enterprise-grade platform for securing, trading and supporting digital assets. A business of Fidelity Investments, one of the world's largest and most diversified financial services providers with more than \$10.2 trillion in client assets under administration, Fidelity Digital Assets combines the operational and technical capabilities of the broader Fidelity organization with dedicated blockchain expertise to deliver a completely new offering for institutional investors.



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