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360 Perspectives

The future of digital currencies

What has happened?

Bitcoin rallied ~300% in 2020 while rising nearly 9x from the 16th March trough to now. Ethereum rose ~470% in 2020 and 15x since March's trough. We discuss what may be the implications for investors.

Why does it matter?

The price rally has triggered an increase in institutional investors and corporates' interest in cryptocurrency. However, institutional participation is still quite limited. Central banks are working on designing and developing their own digital assets and infrastructure that they can control in a centralised manner.

What does this mean for investors?

Investors with a high-risk appetite might be interested in building exposure to digital currencies. Given the possible scenarios and risks, we would treat any such exposure as an option with significant upside potential, but also matched by the risk of complete capital loss, in our view.

Important disclosures can be found in the Disclosures Appendix.

The future of digital currencies

Bitcoin (BTC), and several other crypto assets made a spectacular comeback in 2020 (and in 2021 so far) following a steep decline in 2017. Central banks unprecedented money printing and governments' fiscal response to the Covid-19 pandemic have fuelled worries about currency devaluation and inflationary spikes. These developments have reinvigorated bullish narratives around digital currencies, driving increased interest from institutional investors and corporations as well. In the meantime, central banks across the globe continue to investigate the merits of digital currencies and the use of blockchain for monetary policy use.

While we believe cryptocurrencies are here to stay, regulatory risks can be significant. Investors with an appetite for cryptocurrency may need to consider the optionality nature of such exposure, i.e. potential significant upside matched by the risk of complete capital loss, in our view.

In this paper we discuss the most recent developments around the crypto rally, explore other assets in this digital ecosystem and lastly, focus on the developments around Central Bank Digital Currencies (CBDCs). For reference to specific terminology, refer to page 10.

A pivotal year for Crypto – sizing the rally

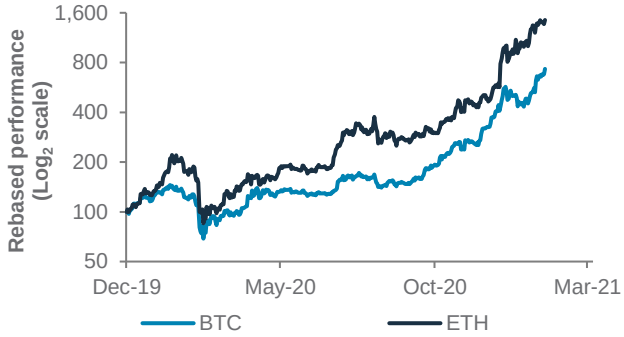
Bitcoin (BTC) – arguably the most widely recognized cryptocurrency and the largest by market capitalisation (USD 920bn) - rallied 305% during the calendar year of 2020, whilst rising nearly 10 times since 16th March trough (at the height of the Covid-19 crisis) through today. Similarly, Ethereum (ETH) - the second largest crypto asset – rose 476% in 2020 and 16x from the March trough. Thus far in 2021, both assets have continued to appreciate. As the time of writing, Bitcoin is hovering near USD 52,000 while Ethereum is recording new all-time highs.

In contrast, the returns of the best performing 'traditional' asset classes during the same time frame paled in comparison. Silver and gold returned 48% and 25% respectively in 2020, as investors focus on hedging inflation upside risks sparked by the unprecedented policy response to the Covid-19 crisis. Year-to-date 2021, WTI oil (+26%) and gasoline (+29%) have provided the best returns, yet still significantly behind the main crypto assets' performance.

This raises the question about whether cryptocurrencies are a new asset class that warrants a significant exposure in clients' allocations and which one(s) might prove the most durable.

Fig. 1 Bubble-like price performance for Bitcoin and Ethereum since March 2020 lows

Bitcoin and Ethereum performance rebased to 100 on 31-Dec-2019



Source: Refinitiv, Standard Chartered
Y-axis shown in Log_2 where each tick mark represents double the previous level

A look at different types of "money"

In their simplest form, **cryptocurrencies** are a type of digital asset designed to work as a medium of exchange and are stored on a computerised distributed ledger, secured by strong cryptography. The first successful cryptocurrency that is still in use today is Bitcoin, which was originally released in 2009. Many others have followed since.

Cryptocurrency proponents argue that Bitcoin could be an alternative to commodity (e.g. gold) or fiat money (e.g. the US Dollar). But what is 'Money'? According to well-accepted definitions, 'Money' is any item or verifiable record that is generally accepted as payment for goods and services and repayment of debts. Its main functions are as a medium of exchange, a unit of account and a store of value.

When scored across traditional definitions of 'Money', Bitcoin ranks poorly. However, when we include additional features such as scarcity, portability, fungibility, divisibility, durability and broad acceptance, Bitcoin scores particularly well against commodity and fiat money except under 'broad acceptance' (though, in this recent rally we witnessed increasing adoption of Bitcoin amongst institutional investors and corporations).

Fig. 2 "Money" scorecard

Bitcoin, Gold and US Dollars compared across the main three functions of "Money"

Criteria	Bitcoin	Gold (Commodity Money)	US Dollar (Fiat Money)
Medium of exchange	**Limited** Increasingly more traded, however, not suitable for frequent, low-value transactions	**Limited** Large, infrequent transactions by financial institutions mainly	**Good** Improved over the years thanks to the increase of eCommerce and digital payment solutions
Unit of account	**Poor** Not widely adopted outside crypto enthusiasts' community. Its high volatility makes it unsuitable for the pricing of goods and services	**Poor** Not common to price things in gold. Investments practitioners may use it more regularly to make historical price comparisons/ adjustments	**Good** Widely accepted unit of account internationally across good and services
Store of value	**Mixed** Over its 12-year existence it has preserved and strongly increased value against inflation. Though, it suffers from 5x higher median volatility versus gold and 10x that of USD (that said, volatility has reduced in recent years)	**Good** Historically good inflation hedge, negatively correlates to real interest rates	**Good** Generally, loses purchasing power over longer periods of time (at least in the recent decades). Enjoys low volatility c. 6% annualised over 12m periods

Source: Standard Chartered

Bitcoin's origin and how it has led to further developments in the crypto assets space

As of January 2021, there exist more than 4,000 cryptocurrencies and although some are very thinly traded, others enjoy popular support backed by communities of enthusiasts and investors.

This wasn't always the case. Technologists and cryptography experts had been working to deliver a form of secure and private digital currency decades before Bitcoin. One of the first attempts started in the Netherlands with a form of "e-cash" on smart cards in the 1980s. Other types of e-cash followed afterwards (DigiCash, Bit Gold, etc.) but eventually failed. Bitcoin's success today is undoubtedly owed to the foundational work laid out by its predecessors.

Why the need for Bitcoin?

According to its founder(s), Satoshi Nakamoto - possibly a pseudonym for a group of people - the vision for Bitcoin at its onset was to create "a Peer-to-Peer Electronic Cash System". The goal was to design a payment and currency system for the internet that didn't have the latency and bookkeeping problems of the payments infrastructure at that time.

Fig. 3 Bitcoin 101 in-brief

Creator	Satoshi Nakamoto
Launched	2008
Objective	Peer-to-Peer electronic Cash System
Benefits	• De-centralised • Anonymous • No double-spending • Secure (cryptography) • Innovative (proof-of-work system) • Incentives structure (mining)

Source: Standard Chartered

While narratives about Bitcoin eventually split in different directions (is it a store of value? Is it a stance against a centralised system? Is it a hedge against hyperinflation?), at its core, its founder(s) saw it as a means to democratise the payment and monetary infrastructure. According to S. Nakamoto, Bitcoin aims to provide anonymity to its users, and it offers a trusted decentralised system of payments where transactions are recorded efficiently (no double spending) and securely. All this would be achieved thanks to the invention of the blockchain (an ongoing chain of group-validated transactions, forming a record that cannot be changed without redoing the entire "proof-of-work").

At present, Bitcoin is the predominant crypto asset, not only because it the longest-standing one, but also because of its market share versus peers. The total market capitalisation of the global crypto market is USD ~1.6tn, of which Bitcoin represents around USD 970bn (~60%), Ethereum (ETH) is a distant second at approximately USD 220 bn.

What other assets matter aside Bitcoin?

Ethereum is often regarded as Bitcoin's main competitor and although the two share a number of similarities, they are also meaningfully different. Ethereum, launched in 2015, differs in that it expands from cryptocurrency to an open-ended, decentralised software platform (arguably the most established one). Its original intent was to complement Bitcoin, not necessarily compete with it. In fact, the Ethereum network's function focuses around facilitating and monetising the operations of Ethereum Decentralised Applications (dApps) and smart contracts. (Smart contracts are a way to embed certain executable instructions via codes into the blockchain e.g. if X satisfies condition Y, then send payment to Z)

Ethereum network's enhanced capabilities for Decentralised Applications has allowed it to spark a movement around Decentralised Finance (DeFi) which is a term used to identify applications built with the intent to replicate (or eventually substitute) aspects and functions of the current financial system in a decentralised manner. One popular outcome of DeFi is 'Stablecoins'.

There exist several stablecoins nowadays – the main ones by market capitalisation are Tether (USDT, ~32 bn) and USD Coin (USDC, ~7bn). While the original purpose of stablecoins was to maintain low price variability with other targeted cryptocurrencies (like a peg), the most popular ones focused on price stability versus the US Dollar. Proponents of these 'coins' argue that they are a fundamental bridge between the new and the old money system and allow for faster exchangeability between cryptocurrencies and fiat currencies. In recent times however, controversies have surfaced regarding the underlying collateral backing for some of these stablecoins. Despite the concerns, adoption is still on the rise.

The role of Institutional Investors and Corporations

Financial infrastructure around crypto and blockchain has continued to develop after the steep price decline in 2017. Private companies have launched new exchanges, developed derivatives contracts, created exchange-traded funds, investment trusts, custody services and more. These developments have laid out a path for institutions to also adopt cryptocurrencies (likely starting with the more established ones initially, such as Bitcoin).

As a result, in 2020, and 2021 thus far, institutional investors have been more vocal about their acceptance of crypto assets. Hedge funds managers have openly shared having their clients' money invested in Bitcoin; some publicly traded corporations have also disclosed holding Bitcoins on their balance sheets (e.g. Square, Microstrategy, Tesla).

In the US recently, a few large, long-only asset managers have registered with the SEC to be able to invest a percentage of their funds in Bitcoin via ETFs, adding to the narrative around increasing adoption.

However, on the flipside, we acknowledge that institution adoption rate is still minimal and likely does not match the media attention received. Studies indicate a majority of the largest shareholders of the more popular Bitcoin trusts are actually crypto-focused institutions. Additionally, investment risk control would likely force asset managers' crypto exposure to minimal levels due to their elevated volatility vis-à-vis traditional assets such as gold. (Figure 4).

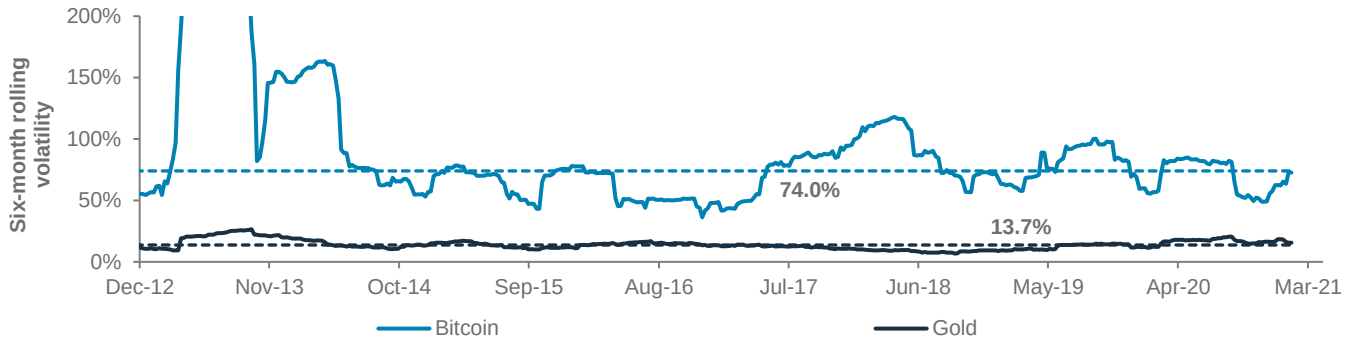
In the end, whether institutional investors will significantly increase adoption or not, will likely depend on the evolution of the regulatory landscape. Debate in this area is still split.

On one extreme, some argue that regulations will eventually outlaw cryptocurrencies in order to favour digital assets issued by existing, centralised authorities (e.g. India's pending draft law banning crypto). On the other extreme, some see a future where the two can coexist and the regulatory environment will foster trust in the decentralised system.

While we believe cryptocurrencies are here to stay, the ultimate winners may well be those issued/supported by central banks. A completely decentralised and unregulated monetary framework may undermine current institutions' ability to respond to changes in business cycles. While some economic purist may view this as optimal, such system may particularly hinder relief measures' efficacy during crises. We may only discover the outcome of these dynamics over a medium- to long-term horizon, but we do know that authorities (particularly Central Banks) are studying this space extensively in order to keep pace with private sector developments.

Fig. 4 Bitcoin's volatility is still significantly higher than traditional safe havens like gold

Six-month rolling realized volatility of Bitcoin and Gold. Horizontal lines are median levels for the period for each respective asset



Source: Refinitiv, Standard Chartered

Fig. 5 Timeline of notable announcements

Selection of notable announcements from institutional investors and corporations

Source: Standard Chartered

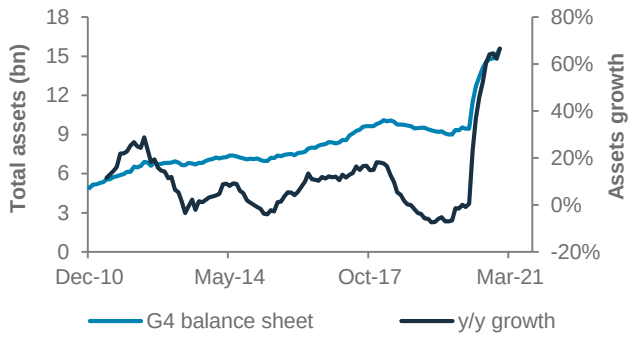
The spark that re-ignited the crypto rally – the pandemic and the policymakers' response

The Covid-19 pandemic will likely be remembered as a historical turning point for monetary and fiscal policy. Governments have responded aggressively to the pandemic using fiscal policy that entailed, amongst its main measures, additional spending and tax relief. The IMF estimated a peak global fiscal deficit of around 14% of world GDP in 2020, with significant fiscal support emanating from advanced economies.

On the monetary policy front, the response has been unprecedented. The largest four central banks expanded their balance sheets by nearly 70% from a year ago, while lowering interest rates, injecting liquidity and inflating money supply in order to support the proper functioning of the financial system. The excess liquidity has likely been a catalyst for the rise in prices of financial assets.

Fig. 6 G4 Central banks embark on a massive balance sheet expansion

Combined total assets of Fed, ECB, PBOC and BOJ in USD terms



Source: Federal Reserve, Eurostat, Bank of Japan, People's Bank of China, Standard Chartered

As a result of these policies, the surge in debt issuance last year took global debt outstanding to nearly USD 280tn by some estimates, and global debt/GDP ratios increased by nearly 20%.

With debt/GDP ratios continuing to rise, and central banks using money printing to support financial stability, proponents of decentralised cryptocurrencies point to these policy actions as some of the key risks brought about by centralised monetary systems, which could in turn lead to currency debasement and loss of purchasing power for the average person.

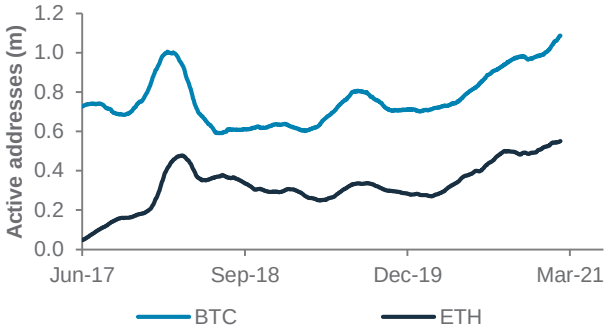
The above conundrum raises questions about the efficacy of monetary policies going forward but also about the impact central banks' actions can have to support individuals (not just businesses), as lower-income segments of the global population have suffered disproportionately from the crisis.

The above is not a new issue. In fact, following the Global Financial Crisis, part of the economic debate centred on how central banks' actions - aimed at financial stability - may have in part contributed to inequality and the adversarial sentiment that sparked waves of populism worldwide. As a result, at the end of its long-term policy framework review in August 2020, Fed's chairman J. Powell stated that in conjunction with the new Average Inflation Targeting framework, "Our revised mandate emphasises that maximum employment is a broad-based and inclusive goal."

How does this issue tie back with developments in the digital space and cryptocurrencies? Central Banks are fighting for their relevance in the digital world. Control of the monetary system, as well as their influence on the wider population are key, particularly at a time when the trend toward cashless payments has accelerated. Moreover, cryptocurrencies are becoming more widely recognised and transacted (Figure 7) by not just small groups of supporters, but also by the wider retail investors group and well-established institutional players as we've previously discussed.

Fig. 7 Cryptocurrencies wider acceptance seen in the increasing number of active addresses

90-day moving averages of active addresses* in the respective cryptocurrency networks



Source: Coin Metrics, Standard Chartered

* The sum of unique addresses that were active in the network (either as a recipient or originator of a ledger change)

Enter the stage: Central Bank Digital Currencies (CBDCs)

The discussion about Central Bank Digital Currencies (CBDCs) has also gathered significant momentum in recent years. This has been the Central Banks' response to the rise of cryptocurrencies and the rapid developments in the private digital payments infrastructure space.

As the Bank for International Settlements (BIS) puts it, "providing cash to the public is a core responsibility of Central Banks and a public good". Hence in their view, a decentralised, private system could pose a threat to monetary policy and financial stability. It would thus be the responsibility of central banks to provide a trusted and centralised alternative to private money, combining "novel digital technologies with the traditional characteristics of central banks – such as trust, transparency and legal backing". One way central banks could achieve this objective is by issuing their own CBDCs as a way to support more resilient and diverse domestic payment systems.

As the name indicates, CBDCs would aim to create digital versions of existing national fiat currencies, possibly – but not necessarily - built on blockchain technology, while operating under a centralised system unlike most cryptocurrencies.

The ECB has recently published a comprehensive report on 'a digital euro' (Oct 2020). In fact, President Christine Lagarde stated that the ECB is considering a retail digital version of the Euro in addition to a wholesale-focused one.

Meanwhile, the People's Bank of China (PBoC) has led the group of central banks with real-life experiments in some of its largest cities. The aim appears to be the launch of a digital Renminbi countrywide by the 2022 Winter Olympics in Beijing. Reportedly, some major state-run commercial banks have begun large-scale internal testing of a digital wallet application for use with the e-RMB as well.

The view from the central bank of central banks

In a recent speech, BIS' general Manager, Augustin Carstens, stated that the development of CBDCs consists of two 'realms': a wholesale one (for financial institutions and large commercial parties) and a retail one ("where the real disruption lies").

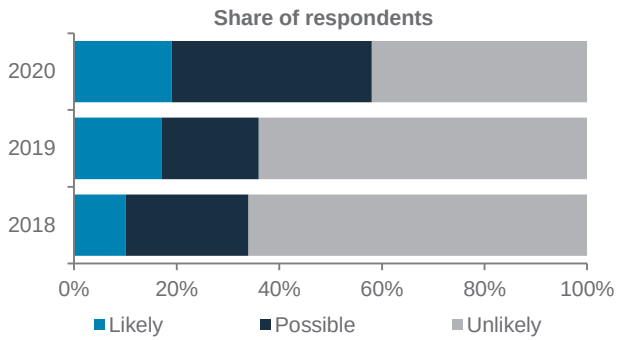
In the rest of his remarks, interestingly, he struck a fairly cautious tone around fully decentralised systems, stating that in the results of the various central banks studies, "safety and robustness" are highlighted as being a key requirement. As such, central banks will play a key role as entrusted institutions (this statement contrasts with cryptocurrencies backers' belief of the superiority of decentralised systems).

Moreover, Mr. Carstens noted that, "central banks see opportunities in digital technologies, not least to enhance payments efficiency and promote financial inclusion".

In conclusion, the BIS admits that developing CBDCs will come with a host of technological, legal and economic issues that will warrant careful examination. Central banks will have to proceed carefully, methodically and in line with their mandates. Issuing a CBDC will be a national choice and wherever issued, CBDCs will be an additional payment option that can coexists with private sector electronic payment systems and cash. However, for the success of these digital currencies in the context of monetary policy, international cooperation will be of key importance.

Fig. 8 Central Banks increasingly likely to participate in the digital assets space

Responses on likelihood of retail CBDC issuance within the next 1-6 years

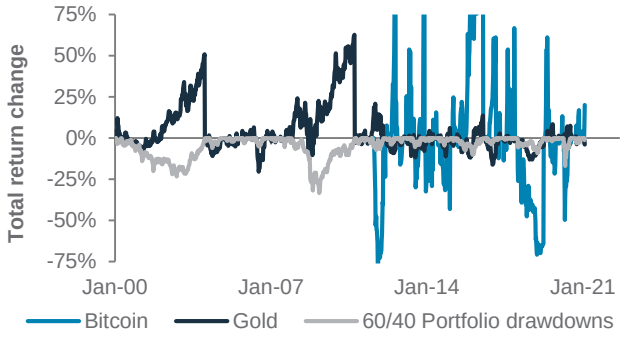


Source: Bank of International Settlements, Standard Chartered "Ready, steady, go? Results of the third BIS survey on central bank digital currency "

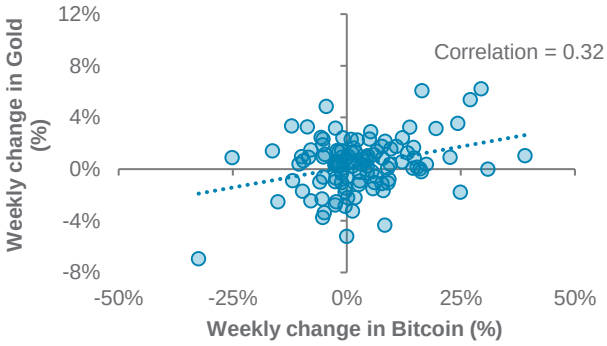
Role of Bitcoin, cryptocurrencies in a diversified allocation

Fig. 9 Bitcoin's function as portfolio hedge still unclear; Has very low correlation to safe-haven gold

Gold and bitcoin performance during drawdowns for a traditional 60/40 equity-bond portfolio



Weekly returns between gold and bitcoin over the past 2 years



Source: Refinitiv, Standard Chartered

Bitcoin, despite being the largest and most established cryptocurrency, still suffers from significant levels of volatility versus traditional asset classes. As volumes grow and adoption increases, BTC may become less volatile in the long run (similar to a small-cap stock becoming large); though, we would not hold our breath.

Some argue that Bitcoin can act as a safe haven during market crashes, however, evidence would dispute such claims. Moreover, BTC, being a high-beta asset, has also experienced wild swings during times of market turmoil that caused drawdowns to a typical 60/40 equity-bond allocation (Figure 9, left-hand chart).

Another key issue around Bitcoin lies on how to properly value it; being a non-yielding, cashflow-less, entirely digital asset makes traditional valuation measures less relevant. Additionally, recent studies show that up to 78% of Bitcoin's supply could be illiquid.

With Bitcoin's overall supply being fixed, price movements could potentially imply investors sentiment/demand for it. Nevertheless, anonymity and the fragmented state of exchanges make it hard to effectively analyse demand using established methods. Trust, therefore, is essential for Bitcoin to be valuable; though, as we know, trust alone can take decades to build and an instant to destroy.

What's the end game?

The world has made giant leaps forward with regards to financial innovation. The Covid-19 pandemic has re-ignited enthusiasm around cryptocurrencies as investors fear central banks' actions may spark inflationary bouts. Unlike in 2017, institutional investors and corporates are warming up to cryptocurrencies. Institutional participation, however, is still quite limited. Though developments around digital infrastructure could draw in more participants.

Central banks are designing and developing their own digital assets and infrastructure that they can control in a centralised manner. We believe, it is still early to confidently predict the future of cryptocurrencies given the developments in the areas mentioned above, and whether decentralisation will prevail over traditional, centralised systems.

In our view, governments will have the final say on whether to allow the existence of private, decentralised digital money. If adoption continue to increase, it will become increasingly difficult for governments to ban cryptocurrencies. There may exist a future where CBDCs coexist with private sector payment systems and cash in harmony, though, getting there won't be smooth sailing. What is certain is that innovation won't stop; and the development of digital payment infrastructure will likely continue to accelerate further.

Investors with a high-risk appetite might be interested in building exposure to this area of markets, either as a hedge or as a speculative investment. A moderate benchmark allocation to gold, for example, could range between 3-5%. In contrast, any allocation to Bitcoin, or other well-established cryptocurrency, would likely be significantly lower. Given the risks (particularly regulatory ones), we would view such investments as having an option - large potential upside but also matched by the risk of complete capital loss, in our view.

Glossary of terms

Altcoins: An altcoin is an "alternative coin," or any cryptocurrency launched after Bitcoin. It refers to any cryptocurrency that is not BTC. For example, ETH, XRP, and LTC are all altcoins.

Asymmetric Encryption: Asymmetric encryption is a cryptographic system that uses a public key for encryption and a private key for decryption. The public key can be shared with anyone, while the private key is meant to be kept secret to maintain security. Asymmetric encryption is considered more secure than symmetric encryption, which uses one key for both encryption and decryption. The Bitcoin network uses asymmetric encryption

Bitcoin: Bitcoin is a blockchain network with a native cryptocurrency (bitcoin). It is the first blockchain and cryptocurrency, hence its dominant presence within the broader crypto ecosystem. Bitcoin was established in 2009 and pioneered Proof of Work, a technology for reaching consensus on a decentralized network

Blockchain Address: A blockchain address is a unique combination of numbers and letters that identifies accounts on a blockchain network. To transact in exchange, digital assets are sent to and from different addresses. An example of a Bitcoin address is '14qViLJfdGaP4EeHnDyJbEGQysnCpwk3gd'

Cryptocurrency: Cryptocurrency is a digital asset that circulates on the internet as a medium of exchange. It employs blockchain technology — a distributed ledger of transactions that is publicly available — and is secured by advanced cryptography. This revolutionary asset architecture allows for certainty that cryptocurrency coins and tokens cannot be double-spent even in the absence of a centralized intermediary. The first cryptocurrency to achieve mainstream success was Bitcoin which paved the way for the proliferation of many other cryptocurrencies

Cryptocurrency Wallet: Cryptocurrency wallets come in a variety of forms, their most basic function is to store a user's private and public keys and interact with various blockchains enabling users to send and receive digital currency and monitor their cryptocurrency balances. Wallets have a public address that can be given out for people to send you digital assets, and a private key to confirm the transfer of digital assets to others. Wallets can be digital (software) or physical (hardware), hot (connected to the internet) or cold (disconnected from the internet), custodial (a trusted third party has control of a user's private keys) or non-custodial (only the user controls their private keys)

Cryptography: Cryptography is a method of protecting information and communications through the use of codes, so that only those for whom the information is intended can read and process it

Decentralised Applications: Decentralized applications — dApps — use blockchain technology to address use cases ranging from investment to lending to gaming and governance. Although dApps may appear similar to web applications in terms of User Experience, dApp back-end processes eschew centralized servers to transact in a distributed and peer-to-peer fashion. dApps rely on wallet software to interact with automated smart contracts on networks like Ethereum.

Decentralized Finance (DeFi): is a major growth sector in blockchain that offers peer-to-peer financial services and technologies built on Ethereum. DeFi exchanges, loans, investments, and tokens are arguably more transparent, permissionless, trustless, and interoperable than traditional financial services, and trend towards decentralized governance organizational methods that foster equitable stakeholder ownership.

Distributed ledger technology (DLT): refers to a shared database upon which transactions and associated details are recorded in multiple places simultaneously. A DLT may be a permissioned network under control by a central authority, or a permissionless network maintained by a decentralized network of nodes lacking a central authority. Blockchains are an example of DLT

Divisibility: To say that money is divisible is to say that a unit of currency can be broken down into smaller units to facilitate exchange

Durability: Durability of money is such that it can be used over and over again; hence it must survive wear and tear for long periods

Ethereum: Ethereum launched in 2015 as a decentralized, blockchain-based global supercomputer to serve as the foundation for an ecosystem of interoperable, decentralized applications (dApps) powered by token economies and automated smart contracts. Assets and applications designed on Ethereum are built with self-executing smart contracts that remove the need for a central authority or intermediary. The network is fuelled by its native cryptocurrency ether (ETH), which is used to pay transaction fees on the network. Open-source, programmable, private, and censorship resistant, Ethereum forms the backbone of a decentralized internet, which has already spawned significant innovation like Initial Coin Offerings (ICOs), stablecoins, and decentralized finance (DeFi) applications.

Fungibility: is the attribute of being mutually interchangeable. Fungibility occurs when a good, asset, or units of an asset are indistinguishable from each other, and so can be interchanged with each other. For instance, one US dollar is equivalent to any other US dollar, and is therefore fungible. Fungibility makes an asset useful as a currency or payment method

Initial Coin Offering (ICO): Initial Coin Offerings or token sales are a fundraising mechanism made possible by blockchain and Ethereum that incorporates the creation and sale of a token to raise funds for a project—usually a new blockchain platform, decentralized application (dApp), or digital asset product. Instead of providing buyers with equity or shares, an ICO sells tokens that usually claim future utility in the products they are sold to fund. Despite this, ICO-launched tokens may still be considered securities, and are subject to jurisdictional regulation.

Peer-to-Peer (P2P) Network: A peer-to-peer (P2P) network structure as it relates to blockchain technology is generally considered decentralized and is designed to operate in the best interest of all parties involved, as opposed to mainly benefitting a single centralized entity. A peer-to-peer blockchain network works by connecting different computers (or nodes) together so they are able to work in unison. This process creates a censorship resistant, open, public computing network that allows important data and other functionalities to be shared across the network

Portability: the ability of money or currency to be easily carried or moved

Proof-of-Work: is a blockchain consensus mechanism first popularized by the Bitcoin blockchain network. Proof-of-Work systems rely on a process of mining to maintain the network. Miners provide computer hardware that competes to solve the complex cryptographic puzzles required to confirm data transacted on the network, and are rewarded for doing so with the network's underlying cryptographic token for doing so. Proof-of-Work blockchain systems are decentralized and secure as compared to other network consensus methodologies, but typically struggle to achieve the network scalability needed for widespread global enterprise adoption. Proof of Work is also criticized for its high energy intensity.

Public and Private Keys: Public-key cryptography (asymmetric cryptography) is a specialized cryptographic system that utilizes pairs of long alphanumeric keys that work together in a pair: public keys, which can be distributed to others, and private keys, which are known only by their owner. Public keys are used to store cryptocurrencies on the blockchain. They are also used to send cryptocurrencies in conjunction with the use of the public key's corresponding private key. The generation of these keys is made possible by the usage of cryptographic algorithms based on mathematical problems to produce a one-way function

Scarcity: refers to the basic economic problem, the gap between limited – that is, scarce – resources and theoretically limitless wants. This situation requires people to make decisions about how to allocate resources efficiently, in order to satisfy basic needs and as many additional wants as possible

Token: Within the context of blockchain technology, a token generally refers to a unit of value for a programmable asset that is managed by a smart contract and an underlying distributed ledger. Tokens are the primary means of transferring and storing value on a blockchain network—most often Ethereum. Tokens can also be designed to be either fungible or non-fungible, depending on a network's specific needs. And while many tokens are primarily used for simple transactions, an increasing number of blockchain projects are designing tokens encoded with a variety of wide-ranging use cases, primarily in regard to on-chain governance and network maintenance

Source: Gemini, Standard Chartered

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