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The future of cryptocurrency and blockchain technology in finance

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The future of cryptocurrency and Blockchain technology in finance

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Abstract Cryptocurrencies have been all the rage in recent years, drawing many to hold them as speculative investment assets. Its proponents also champion the secure and decentralised nature of the technology it is based on, called the Blockchain. Given the secure nature of Blockchain technology, the idea of adopting cryptocurrencies as legal tender currency has also been mooted and experimented with — the most famous example being the Central American nation of El Salvador's bold move to adopt the cryptocurrency Bitcoin as legal tender in September 2021. In theory, this would provide a solution to the high transaction costs faced by overseas El Salvadoreans when transferring money home and to the lack of bank accounts in the case of 70 per cent of its population — Bitcoin does not require a bank account and can be transferred across borders easily. However, even though individual consumers seem to evince interest in adopting cryptocurrencies as legal tender, most countries have little appetite to do so or to integrate their use into their citizens' lives. Does cryptocurrency have a future as a legal tender currency or as an investment asset? If not, what are the potential future developments? This paper examines and attempts to answer these questions by (i) analysing the pros and cons of adopting cryptocurrencies as legal tender; (ii) discussing alternative uses for the Blockchain technology behind cryptocurrency; and (iii) reviewing regulatory challenges to cryptocurrency as an investible asset.

KEYWORDS: cryptocurrency, Blockchain, stablecoin, decentralised finance, central bank digital currency

INTRODUCTION

Before money was accepted as a medium of exchange for people to obtain goods and services, bartering was one way that people exchanged goods for other goods. This slowly evolved into using gold and precious metals and eventually paper money. A new medium, cryptocurrency, has emerged in recent times with the expansion of digitalisation. While many individuals may be apt to equate cryptocurrency to more well-known cryptocurrencies such as Bitcoin or Ethereum, there are, in fact, more than 5,100 cryptocurrencies in the market today, such as Tether, XRP, Litecoin and the infamous Dogecoin.

Decentralised finance (DeFi)

To illustrate how cryptocurrency works, we first need to understand what decentralised finance, known as 'DeFi', is and how it works. DeFi is an increasingly emergent financial system that is seen as an alternative to the traditional financial system based on centralised financial institutions such as banks and brokerages — known as centralised finance.

In centralised finance, third parties such as banks facilitate money movement between parties, with each bank charging fees for using their services. In contrast, DeFi eliminates financial intermediaries (and the fees that they charge) by enabling individuals to conduct peer-to-peer financial transactions by utilising Blockchain technology. In fact, P2P financial transactions are one of the important premises behind the DeFi.¹

Both DeFi and cryptocurrencies rely on Blockchain technology. Blockchain works as a public ledger where all transactions are recorded and verified by other users. Each verified transaction is recorded in a new 'block'. Subsequent blocks contain information about the previous 'blocks'

and are chained together; hence the name 'Blockchain'. The previous blocks cannot be altered without affecting the subsequent blocks, giving users the assurance that transactions on the Blockchain are immutable and secure from hacking.

Cryptocurrency and the Blockchain

Cryptocurrency transactions utilise a 'consensus mechanism', which is a system that requires all computers or 'nodes' in a cryptocurrency network to agree on which transactions are legitimate. This is a function carried out by financial intermediaries in traditional centralised finance. For a new transaction to be verified, a majority of the 'nodes' must agree that the transaction is valid, following which the transaction will be added to the Blockchain, establishing an immutable record. There are two major consensus mechanisms used by most cryptocurrencies today, proof-of-work and proof of stake.²

Proof-of-work

Proof-of-work (POW) is the original cryptocurrency consensus mechanism, used by Bitcoin and Ethereum 1.0. POW Blockchains contain transactions that are verified by nodes (which are also known as 'miners') solving a mathematical puzzle. The first miner to solve the puzzle validates a new block that is added to the Blockchain, and the miner is rewarded with a predetermined amount of cryptocurrency by the network.

The advantage of POW is that a malicious actor seeking to input fraudulent transactions would require more than 50 per cent of the network mining power (comprising all the miners solving puzzles) in order to create a fraudulent block. This is prohibitively expensive, given the amount of computing power required. In addition, validators are

penalised for submitting invalid information in the form of incurring computing power without obtaining any financial reward.

There are weaknesses to POW, namely the fact that it is extremely energy-intensive owing to the high amount of computing power required. It presents many challenges in terms of scalability. Energy wastage is rampant from duplicate processes where multiple miners race to solve the same puzzle, only the quickest of whom is rewarded. This means that the rest of the identical work done is rendered useless. In 2021, Bitcoin mining consumed approximately 105TWh per year, equivalent to 0.55 per cent of global electricity production, according to a tool created by the Cambridge Centre for Alternative Finance (CCAF). This sheer amount of computing power required presents limitations to scalability.³

Another weakness of POW is the possibility that transactions could be reversed. The first scenario occurs when two miners broadcast the same block at the same time, such that two different paths emerge. Both blocks will be accepted at that point of time, as they were verified based on different sets of transactions. New blocks are added to both until one chain is longer than the other, and the longer chain is established as the official ledger. This usually happens within one or two blocks forming, upon which all transactions previously accepted on the other chain are reversed.

The second, albeit less likely, scenario occurs when a malicious attack is successfully made on a network. The attacker would, however, require a massive amount of computing power to create a separate chain more quickly than the original chain, in order for it to be recognised as the 'single source of truth'. This reduces any potential financial gain from a successful attack. For Bitcoin users, six block confirmations amounting to approximately 1 hour is a sufficient time frame for a transaction to be considered final, as there is little financial benefit to reversing so many blocks.

Probabilistic finality, which is the possibility of a reversed transaction as described previously, in POW creates higher systemic risk across the network and makes it unsuitable for retail payment and other forms of payments that are time sensitive.⁴

Hence, alternatives have been developed, of which proof of stake (POS) has been most widely adopted. The first implementation of a POS-based cryptocurrency was Peercoin. It has since been adopted by Ethereum 2.0 and newer cryptocurrencies.⁵

Proof of stake

The POS verification method limits the number of transactions each participant can verify, based on the amount of cryptocurrency they stake with the network. A participant, or 'validator', gains eligibility to verify transactions when they stake cryptocurrency with the network. The more staked, the higher the chances of being chosen. The validators' staked cryptocurrency funds serve as economic incentives to act in the network's best interests. Should a bad block or fraudulent transactions be wrongly accepted, or if a node goes offline, a corresponding proportion of the validator's staked funds are taken by the network. This contrasts with the POW method, which does not require any skin in the game from miners. Hence, becoming a validator is a commitment in the form of financial outlay and technical knowledge required.

The important advantage of POS over POW is that it requires substantially lower energy consumption. In comparison with POW, where the race to solve Blockchain puzzles can require the consumption of huge amounts of electricity to power the computing systems solving the puzzles, POS is more energy efficient and eliminates the energy wastage incurred by slower nodes that fail to get the verification reward. Ethereum, which has also transitioned fully to a POS mechanism, estimates a 99.95 per cent decrease in its energy usage.

POS also eradicates the occurrence of separate chains forming, and the subsequent reversal of verified transactions deemed invalid on the shorter chain, which is prevalent in POW. Besides ensuring finality of transactions, POS also allows transactions to be verified in a shorter time. To illustrate, the average transaction speed for Bitcoin is at least 10 minutes owing to the time required for puzzle solving. In comparison, Solana, a cryptocurrency platform that uses the POS mechanism, averages around 3,000 transactions per second (TPS).⁶

Given its vastly lower energy consumption, scalability and speed of verification, the use of POS makes the adoption of cryptocurrency as legal tender much more viable. For example, Ethereum's new POS-based Blockchain ETH2 (slated for a 2023 launch) can process a vast array of DeFi transactions and smart contracts, as well as NFT minting and sales, at a much lower electricity cost and higher speed as compared with POW-based Blockchains.

Cryptocurrency types on the market today

Both tokens and coins are considered forms of cryptocurrency but perform different functions. Coins are built on their own Blockchain and were originally intended as a form of currency, like fiat money. Tokens are created on an existing Blockchain and can serve as (i) programmable assets to execute unique smart contracts, which can establish ownership of assets in the real world, outside the Blockchain network; (ii) representation of units of value of real-world goods that can be sent and received, such as electricity or money; and (iii) software application where identity verification or tracking orders in supply chain management are required.

As of November 2022, the top three cryptocurrencies based on market capitalisation are Bitcoin (BTC), Ethereum (ETH), which are tokens, and Tether (USDT), which is a stablecoin. Table 1 explains the different types of cryptocurrencies.⁷

Table 1: Comparison of cryptocurrency types.

Cryptocurrency type	Example	Characteristics	Uses
Token	Ethereum (ETH)	Designed to be independent of financial intermediaries, can be created on other Blockchains.	<ul style="list-style-type: none"> • Programmable asset • Representation of real-world units of value • Part of software application
Coin	Ripple (XRP) Bitcoin (BTC)	Built on own Blockchain; XRP is unique in that it is built on the Ripple network, which employs a unique system for validating transactions in which participating nodes conduct a poll to verify transactions. This makes XRP transactions faster and cheaper than Bitcoin.	<ul style="list-style-type: none"> • Medium of exchange and value transfer, form of currency • Enables payment systems to minimise intermediary process
Stablecoin	Binance USD (BUSD) Tether (USDT)	Designed to offer stability, transparency and lower transaction fees to users. For example, Tether is pegged 1:1 to the USD to avoid volatility.	<ul style="list-style-type: none"> • Low-cost transfer on the Blockchain • Trade on different centralised and decentralised exchanges (DEXs) • Deposit to earn an interest rate • Payment for goods and services • Collateral and loan asset • Cross-collateral in futures trading • Storage on an exchange or wallet

CRYPTOCURRENCY'S POTENTIAL FOR ADOPTION AS MASS MARKET LEGAL TENDER

In response to the growing public awareness of cryptocurrency, many countries have rolled out technological innovations for digital currency payment and storage options across different channels. Will these measures be sufficient to expand the use of cryptocurrency beyond an investment asset with speculative value? If so, how much government intervention will be required to mitigate the risks that would accompany the transition of cryptocurrency to a legal tender currency? We now examine the various factors impacting the potential for cryptocurrency to be adopted as a legal tender currency. We also examine the case study of El Salvador's attempt to adopt Bitcoin as legal tender currency.

INCREASED CONSUMER INTEREST IN CRYPTOCURRENCY AS MONEY ACCELERATED OWING TO COVID-19

Today, there is considerable interest from consumers in cryptocurrency as money

and also as an investment asset. CNBC reported in March 2022 that one out of every five Americans had used or invested in cryptocurrency. In Singapore, the *Straits Times* reported in late 2021 that nearly 16 per cent of Singaporean adults currently own cryptocurrency.

A study by Citi Research indicated that the number of cryptocurrencies on that market has been consistently on the rise since 2013, while the market cap saw a dip in 2018, followed by substantial growths of 295 per cent in 2020 and 192 per cent in 2021, as shown in Figure 1. This suggests that COVID-19 accelerated an ongoing change in customer behaviour towards cryptocurrency and digital finance.⁸

A survey-based study conducted in the USA revealed that during and after the COVID-19 pandemic, consumers became more likely to use cryptocurrencies as money for daily online transactions, to avoid physical interactions with people outside of the home.⁹

COVID-19 led to significant fiat money expansion as central banks tried to support

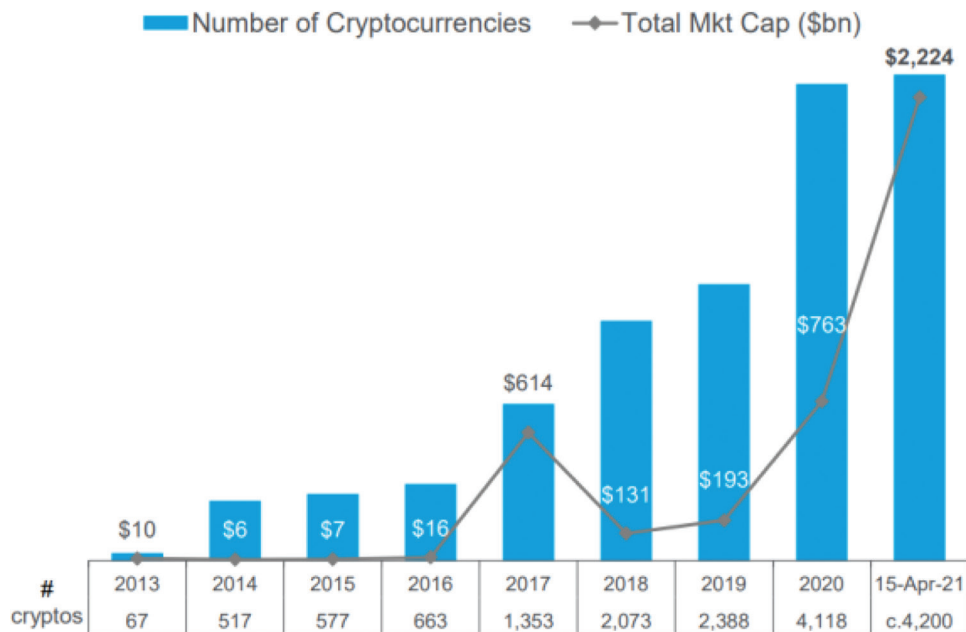


Figure 1 Number and value of cryptocurrency over time

Source: coinmarketcap, Citi Research.

economies during the lockdown, and this led to a loss of confidence in the dollar as the volume of USD in circulation kept increasing. In contrast, cryptocurrency like Bitcoin had a finite supply. Consequently, many looked to cryptocurrency as an alternative risk asset.¹⁰

Increased acceptance and support of cryptocurrency payments by merchants and financial intermediaries

With more consumers understanding and using cryptocurrency as money, there has been a notable growth in the number of merchants accepting cryptocurrency payment in response to consumer demand. For example, large organisations like Microsoft accept cryptocurrency payment on their websites and online stores. New cryptocurrency payment companies have also sprung up to meet demand for cryptocurrency payment. Bitpay, a new payments company, accepts cryptocurrency as payment with a 1 per cent fee, and Visa, an established financial services company, has also pivoted to offer cryptocurrency cards and digital wallets to facilitate cryptocurrency payment solutions. Its competitor, Mastercard, has also invested in cryptocurrency patents in preparation for central bank digital currency (CBDC) launches, which they foresee in the near future. PayPal and Venmo, both behemoths in the e-payments market, also accept online cryptocurrency payments, with PayPal going a step further to offer account holders the option of a digital wallet to trade other virtual currencies.¹¹ Notably, despite its roots in the DeFi movement, support from financial intermediaries in the form of infrastructure is needed for mass market adoption of cryptocurrency.

Government support and regulation of cryptocurrency

The anonymity and privacy that cryptocurrencies offer make them ripe for criminal exploitation. The Blockchain's

encryption of data enables criminals to avoid transactions being traced back to them, making cryptocurrency the perfect tool for illegal activities such as money laundering and ransomware.

Government intervention in the form of laws and regulatory checks is necessary to prevent misuse and fraud. For example, background checks along with identity verification should be conducted on individuals when they set up wallets. Transactions should be tiered with anonymity granted only to lower limits. The lack of regulatory support is a main cause of cryptocurrency price volatility.

Value stability

It goes without saying that stability in value is one of the most important aspects of a fiat currency. No one wants to use a currency whose value fluctuates wildly from day to day.

Cryptocurrencies are notoriously susceptible to crashes and bubbles caused by financial speculation and have historically suffered from high volatility in their values. For example, in 2018, Bitcoin was worth around US\$17,500 in January. In December of that same year, it crashed to about US\$3,200 — 20 per cent of that value. In January 2020, 1 Bitcoin was worth about US\$8,500 — this skyrocketed to over US\$64,000 in the first half of 2021.¹²

For cryptocurrency to be considered money for the mass market, it needs to fulfil the three functions of money, which are (i) medium of exchange, (ii) measure of value and (iii) store of value. Unless it is a stablecoin that pegs its value to a fiat currency, the value of cryptocurrency is unstable/volatile and therefore does not fulfil one of the functions of money — store of value.

El Salvador's adoption of Bitcoin as fiat currency

On 7th September, 2021, El Salvador adopted Bitcoin as legal tender in a bid

to control inflation and promote financial inclusion. With approximately 70 per cent of its citizens unbanked, Bitcoin and digital wallets were thought to be the answer to providing citizens with access to financial services.

Another problem that Bitcoin legalisation aimed to solve was the cost of remittance. In El Salvador, remittances accounted for more than 20 per cent of GDP in 2020, translating into a 1 per cent loss of GDP on remittance fees. It seemed that Bitcoin could provide a promising solution, and the government believed that other benefits such as increased foreign investment and tourism could follow.¹³

At the time of adoption, 1 Bitcoin was worth almost US\$47,000. A year later, however, it was trading at less than half that value. As explained previously, the speculative nature of the asset meant that the value of the Bitcoin fluctuated wildly, in some cases losing more than 10 per cent of its value in one day. Understandably, businesses were reluctant to accept Bitcoin owing to its volatility.

Bitcoin adoption did not fare well among the citizens either. Although in theory, El Salvador is an ideal candidate for cryptocurrency adoption owing to its large unbanked population, this target group had low financial literacy and did not understand or trust Bitcoin. Despite Salvadoran law requiring all companies to accept cryptocurrency, only 20 per cent of 1,800 Salvadoran households interviewed did so.

Salvadorans working abroad were also encouraged to make remittances home through the Chivo government wallet, or other private ones, without charging commissions. In the nine months following the Bitcoin adoption in September 2021, however, Central Bank statistics showed that less than 2 per cent of US\$6.4bn in remittances was transferred via digital cryptocurrency wallets.

Overall, the majority of the country's 6.5m inhabitants shared the sentiment

that they did not benefit from the Bitcoin policy.¹⁴ Weighing the pros, that is, public interest in cryptocurrency and the infrastructure set up by merchants for its use, against the cons, that is, the historical lack of stability in the value of cryptocurrencies and the potential for criminal abuse, we believe that the cons currently outweigh the pros. The biggest obstacle is the enduring lack of stability in the value of cryptocurrencies that renders them unsuitable for use as a medium of exchange or as a store of value. For example, Bitcoin had lost more than 15 per cent of its value in one day. This is starkly illustrated by El Salvador's Bitcoin experiment failure. Owing to cryptocurrencies' roots in DeFi, there is no authority such as a central bank to step in and prop up the value, as compared with traditional currencies. Stablecoins are also not an answer, as shown by the collapse of the TerraUSD in September 2022.

We believe, however, that while cryptocurrencies are unsuitable as legal tender currency to be used by the general population, there is (i) potential for the underlying Blockchain technology to fill an existing gap in the financial ecosystem in the form of central bank digital currencies and (ii) potential for their use as currency in the metaverse.

BLOCKCHAIN TECHNOLOGY AND CENTRAL BANK DIGITAL CURRENCY

CBDC is an electronic form of central bank money with potential wide use by households and businesses to store value and make payments.¹⁵ In short, it is a direct liability of a payment instrument issued by the central bank, subject to the country's monetary policies. It is based on a digital ledger controlled by the central bank. CBDCs are split into two categories — wholesale and retail. Wholesale CBDCs are used for interbank settlements and are akin to the reserves commercial banks

place with central banks today, while retail CBDCs are the digital equivalent of legal tender money.

We are of the view that Blockchain technology has a part to play in CBDCs. The unique and secure nature of the Blockchain will be very useful in ensuring the validity and security of transactions using CBDCs. The nature of the Blockchain also lends itself to auditability, as all transactions are set out and immutable.

It is common knowledge that the Monetary Authority of Singapore (MAS) is interested in developing CBDCs.¹⁶ The Managing Director of the MAS, Mr Ravi Menon, has stated that wholesale CBDCs are a potential game changer for cross-border payments, as they reduce processing time drastically. As a result, we believe that the building block of cryptocurrencies — Blockchain technology — has the potential for further development and utilisation in Singapore.

Singapore has explored the use of Blockchain technology in CBDCs

Project Ubin (wholesale CBDC)

In 2016, MAS launched a project exploring the use of Blockchain and Distributed Ledger Technology (DLT) for interbank clearing and settlement of wholesale payments and securities, with the purpose of better understanding the technology and the potential benefits it may bring through practical experimentation with the financial industry.

One experiment was to re-imagine real-time gross settlement (RTGS) using DLT. Another experiment was to make cross-border payments cheaper, faster and more efficient through a wholesale CBDC infrastructure shared by multiple central banks. The final experiment enabled broad ecosystem collaboration by laying down an infrastructure for proof-of-concept development and testing involving banks

and third-party providers, covering capital markets, trade finance and insurance.¹⁷ This set the groundwork for Project Orchid, which was launched at the Singapore FinTech Festival in 2021, following the completion of Project Ubin.

Project Orchid (retail CBDC)

Project Orchid was launched with the objective of building the foundational technology infrastructure and competencies necessary to issue a retail CBDC, should Singapore decide to do so in the future. While MAS has assessed that there is no immediate need for a retail CBDC in Singapore, evolving consumer preferences and growth in the digital asset ecosystem could catalyse innovative uses of digital currency.

Another avenue that Project Orchid is exploring is programmable money, which has been coined Purpose Bound Money (PBM). With programmable payment, the user can define a set of programming logic to be applied across different forms of PBM, platforms and systems.

In Singapore, a good use of PBM would be to digitalise vouchers, such as those from government distribution programmes. For example, Community Development Council (CDC) vouchers were distributed during the COVID-19 pandemic to defray the cost of living and to support hawkers and heartland merchants affected by the pandemic. Distributing the vouchers in the form of PBM would allow recipients to use the vouchers from their mobile phones without requiring a bank account. Further programming can be done to allow variations such as allowing the vouchers to be transferrable or pre-programming eligible households or merchants accordingly. We are of the view that PBMs are a classic opportunity for Blockchain technology to be utilised — in this case, this technology would prevent fraudulent use of these vouchers.¹⁸

China is leading in retail CBDC implementation

While Singapore and other countries have run large-scale experiments with wholesale CBDC for interbank clearing and settlement, China has made significant progress in the implementation of its retail CBDC known as the Digital Currency Electronic Payment (DCEP) system.

China's central bank, the People's Bank of China (PBOC), had already conducted several pilots of the DCEP in various cities, including Shenzhen, Suzhou and Chengdu, in 2020. These pilots involved distributing the digital currency to users who were able to use it for purchases and transfers via a digital wallet and phone app provided by the Agricultural Bank of China.¹⁹ Famously, during the Beijing Winter Olympics 2022, DCEP was used to transact over US\$315,000 each day as retail payments during the event.

One of PBOC's motivations behind DCEP was to provide an alternative to Ant Financial's Alipay and Tencent's WeChat Pay, which have become dominant retail payments providers in China and therefore too big to fail. Alipay reported that it can process 250,000 TPS.

The earlier prototypes of DCEP used Blockchain technology, but owing to the throughput limitations of Blockchain and to achieve a target of 300,000 TPS (to surpass Alipay), since 2019 DCEP has abandoned Blockchain in favour of a centralised ledger. Each digital currency token held by a user would be constructed with a cryptographic algorithmic expression and stored as a dataset array containing information about transactions and ownership.

PBOC has released a set of regulations for the DCEP, which outlines its legal status and the responsibilities of various stakeholders in its use. These regulations also provide guidance on anti-money laundering (AML) and counter-terrorism financing (CTF) measures.

China has made significant progress in the implementation of its retail

CBDC, with several successful pilots, technical development and regulations. Implementation, however, has not gone beyond the pilot stage.

POTENTIAL USE OF CRYPTOCURRENCY IN THE METAVERSE

The metaverse is a culmination of technologies such as virtual reality (VR), augmented reality (AR) and mixed reality (MR) to create an open virtual world where users can interact socially and for work. PricewaterhouseCoopers (PWC) analysts predict that the metaverse ecosystem could be worth US\$1.5tn by 2030.²⁰

Use cases for cryptocurrency as a means of payment within the metaverse include (a) DeFi applications that use cryptocurrency to provide financial services such as lending, borrowing and trading within the metaverse, (b) cryptocurrency can be used to buy and sell virtual real estate in the metaverse used for a variety of purposes such as hosting events and creating virtual businesses and (c) cryptocurrency rewards can be used to incentivise users to participate in the metaverse by completing tasks or participating in events.²¹

It is posited that much of this value is likely to be realised via cryptocurrency, as a frictionless method of exchange of value in the metaverse. It allows the exchange of goods to stay within the metaverse, without any reliance on external middlemen.²²

CRYPTOCURRENCY AS AN INVISIBLE ASSET – REGULATORY CHALLENGES

Cryptocurrency saw explosive growth in the last decade, particularly during the pandemic. The current market cap, however, stands at US\$811bn (as of 18th December, 2022), less than a third of its peak at US\$3tn. In Singapore, although there are no regulations

against it, retail investors are discouraged from holding cryptocurrency as investment assets. Globally, it would not be out of the question for governments, especially from developed nations, to place a ban on cryptocurrency owing to its volatility. In fact, China banned cryptocurrency trading in September 2021.

Cryptocurrency regulators face the challenge of containing risks while allowing the benefits to be reaped. To a moderate extent, regulators are responsible for protecting unsophisticated investors. While they cannot dictate the amount of risk, safeguards can be put in place.²³ In Singapore, individuals would have to qualify as accredited investors, by showing proof of income of at least S\$300,000 in the last 12 months, to invest in hedge funds and other unregistered securities not available to the public. The same could apply to individuals who wish to persist with holding cryptocurrency as investment assets.

Next, although cryptocurrency technology may offer convenience in payment, it poses a challenge in terms of transparency and traceability. To prevent cryptocurrency usage on illegal activities, governments and financial intermediaries can mitigate these risks with mandatory identity verification, along with placing limits on anonymous fund transfers. This could, however, result in additional costs that reduce the attractiveness of cryptocurrency payments.

The liquidity of cryptocurrency leaves space for large-scale redemption, which could result in panic and disrupt market stability. Cryptocurrencies such as stablecoins are pegged to fiat currency, but there remain many other types with fluctuating value that could spark panic among investors and trigger large-scale selling and further drops in prices. Regulators are unable to control market sentiments, and, hence, an option would be to regulate barriers to entry for retail

investors. For all potential challenges that may arise, regulators need to proactively manage the corresponding costs and benefits.

Cryptocurrency trading in Singapore

Cryptocurrencies pose a challenge to the aforementioned structure as they allow users to bypass financial intermediaries. In Singapore, cryptocurrency is not accepted as a transaction currency. Entities providing services relating to these tokens require licensing and cannot bypass supervision by MAS, as part of a measure to ensure that they are not used for money laundering and terrorism financing purposes.

The stance in Singapore on cryptocurrency is discouraging towards retail investors holding them as investments assets, owing to the lack of sound economic fundamentals. MAS, however, recognises the benefits that cryptocurrency tokens and Blockchain innovations can bring. In cases where reliance on a central party for the history of ownership and transfer of value is too costly or risky, cryptocurrency tokens present a good alternative solution. Strong use cases include cross-border payments and trade finance, as this would improve efficiency by reducing the need for documentation.

CONCLUSION

We are of the view that cryptocurrency is unlikely to be adopted successfully as a mass market (retail) legal tender currency in the short term and is likely to face further regulation to prevent its exploitation by criminals and bad actors. The El Salvador case study is an example of a failed attempt to establish Bitcoin as legal tender due to a lack of regulatory support, price volatility and a lack of public trust in cryptocurrency. There is, however, potential for the use of cryptocurrency as a means of DeFi and

payments within the metaverse. More interestingly, there is considerable potential for the underlying Blockchain technology to be employed by governments and countries in the roll-out of wholesale CBDCs and PBM.

The adoption of wholesale CBDCs is likely to be beneficial to governments in terms of efficiency, as shown through experimentation, in the areas of interbank clearing and settlement of wholesale payments and securities, DLT-based RTGS and cross-border wholesale payments. It is hence also a possibility that governments will be willing to invest in CBDC infrastructure for use by financial institutions first, followed by retail usage as consumers gain confidence in the system.

Blockchain-based CBDCs are limited owing to throughput constraints and are very unlikely to support mass market retail payments in the short term. China's retail CBDC has had several successful large-scale pilots, with a throughput capability of 300,000 TPS, but only after abandoning Blockchain in favour of a centralised ledger.

Although this somewhat contradicts the preface of DeFi, mainstream cryptocurrency adoption requires some form of governance and is likely to gain traction in the form of wholesale CBDCs in the short to medium term, with adoption by retail consumers increasing in the long term.

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