HSBC Global Research

17 March 2021

Digital currencies

What are they and why do they matter?

Free to View
Economics & Currencies - Global

- As cash usage declines, new forms of digital money are emerging
- We look at cryptocurrencies and Central Bank Digital Currencies…
- …and outline the impact they could have on the economy and policy decisions

James Pomeroy
Global Economist
HSBC Bank plc

Paul Mackel
Global Head of FX Research
The Hongkong and Shanghai Banking Corporation Limited

As cash usage plummets in many parts of the world, the role played by new forms of digital currencies in the payments chain is only going to grow. But what sort of currencies? Cryptocurrencies? Central Bank Digital Currencies (CBDCs)? Stablecoins? Perhaps a mix of them all? These forms of money are all solely digital – and are either issued via the central bank or privately.

Cryptocurrencies, in particular, have been getting a lot of attention recently because of Bitcoin's spectacular price rise and the responses to it – with an increasing number of institutional investors showing an interest. Stablecoins, such as Diem, led by Facebook, have also gathered much more attention in recent years.

There is no doubt that the rise of cryptocurrencies and stablecoins has alerted governments and policymakers, and is one reason why a number of central banks are drawing up plans for their own digital currencies. Sweden and China are leading the way, but these central banks have other motives too, based on the rapid developments of digital payments in their economies.

This report will look at the differences between these forms of digital payments and the potential economic and monetary impacts.

At its heart this will be a battle over what best serves as a means of payment and/or store of value in the digital age. The current macro implications of both cryptocurrencies and stablecoins are limited – but this may change depending on how the underlying technology develops and the number of use cases grows. Tracking how both of these factors develop will be important in the coming years.

Central bank digital currencies will likely have a greater economic impact. But the leading pilots in China and Sweden are converging on a similar design in a way that may mean that, while payment networks could be more efficient and secure, most of us may not notice a difference day to day. How these pilots develop and how other central banks react will also be key to follow.

While there has been much excitement over cryptocurrencies and CBDCs, it is just as important to remember the implications of getting many of the millions of unbanked people across the world access to more traditional digital payments, which is likely to have a far greater near-term economic impact.

This is an abridged version of a report by the same title published on 17-Mar-21. Please contact your HSBC representative or email AskResearch@hsbc.com for more information.

Issuer of report: HSBC Bank plc

View HSBC Global Research at:
https://www.research.hsbc.com

Digital currencies

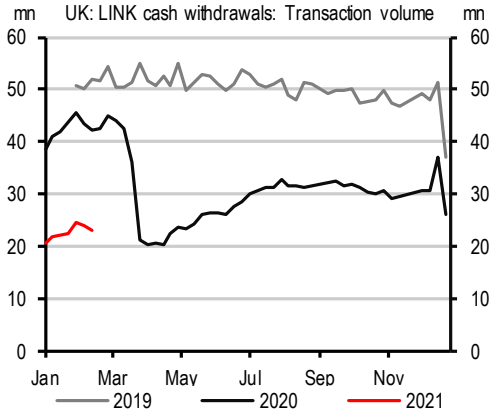
- The pandemic has accelerated the decline in cash usage…
- …and has coincided with more interest in private forms of digital money…
- …such as cryptocurrencies and stablecoins

The demise of paper money has been accelerated

The world is moving away from cash payments

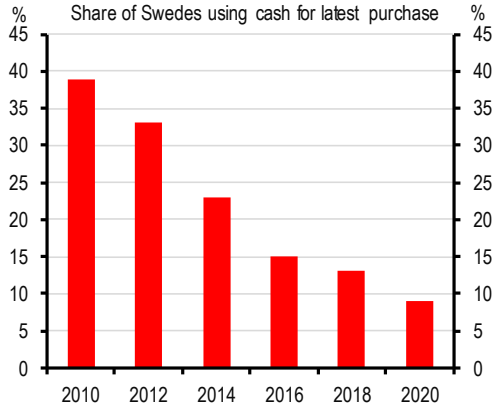
The pandemic has caused many things to change in our lives – but one trend that has clearly been accelerated is the demise of paper money for payments. While this is a trend that is most readily observed in developed market data, such as in the UK (chart 1), in many emerging markets we've seen the use of digital payments rise as businesses have opted against taking in-person payments and avoided transacting in cash due to fears of viral spread[1], while in Germany, card payments are expected to have overtaken cash payment volumes for the first time[2]. Sweden, where cash payments have collapsed as a share of total payments over the past decade, shows how quickly the world's payments could digitise as a result of this trigger.

1. UK data shows how quickly cash usage has fallen during the pandemic…



Source: LINK. Note: Number of transactions. Weekly data.

2. …while Sweden's drop in cash usage over the past decade is a lesson for all



Source: Sveriges Riksbank

Whilst most of this shift has taken place with cash payments being replaced by card and mobile wallet payments, new forms of digital money – such as cryptocurrencies and central bank digital currencies – have grown in prominence. In this report, we aim to explain the difference between these forms of payment and how they could affect the economy and central bank decision making.

[1] However, many of those fears may be misplaced, as outlined in: Covid-19, cash, and the future of payments, BIS, 3 April 2020.
[2] The German Consumer: Rapid Evolution Amidst the Crisis, Euromonitor, 17 September 2020

What are the different types of money?

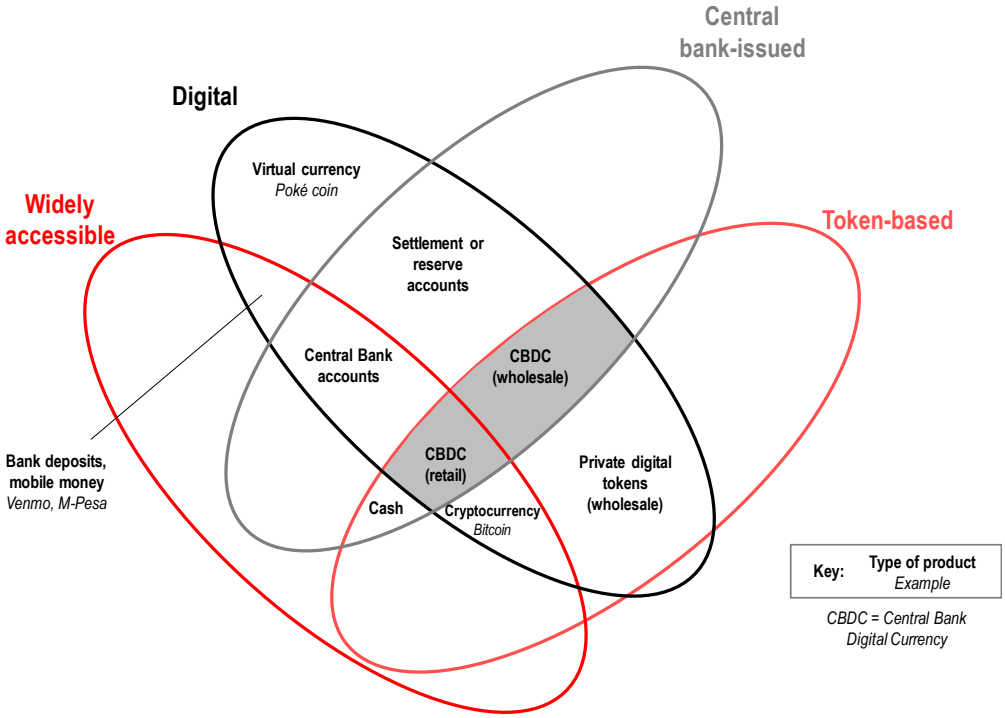
To begin with, let's look at the different qualities of various forms of money. We all know about cash, and about bank deposits – but the qualities of other forms of money aren't so clear. Chart 3 shows the BIS' money flower – which breaks the different forms up clearly. Cash is universally accessible and central bank issued (and a token), but it is not digital. Bank deposits are of course digital, and while widely accessible, are not completely universally accessible.

An account-based system requires verifying the identity of the payer, while a token-based system requires verifying the validity of the object used to pay

Against this, cryptocurrencies, such as Bitcoin, operate outside of the central bank's sphere – and are token-based, like cash, and stored in wallets. Virtual currencies, such as those within games or online universes are also outside of the central bank system, but are not token-based, relying on the object used to pay – be it physical or digital. All of those currencies exist within an account, solely within that ecosystem.

As is clear on the 'money flower', central bank digital currencies (CBDCs) sit in the middle of this. These products, which we will explore in more detail later, are a form of money that is central bank provided, digital, universally accessible, and token-based, sitting in the middle of the diagram and clearly providing (in theory) an all-encompassing form of money.

3. The money flower shows the different qualities of types of money



Source: BIS

What's the difference between them?

The practical applications of the different forms of money are outlined in the table below. The differences are clear to see – with central bank digital currencies having the ability to achieve a mix of the qualities of the other payment options.

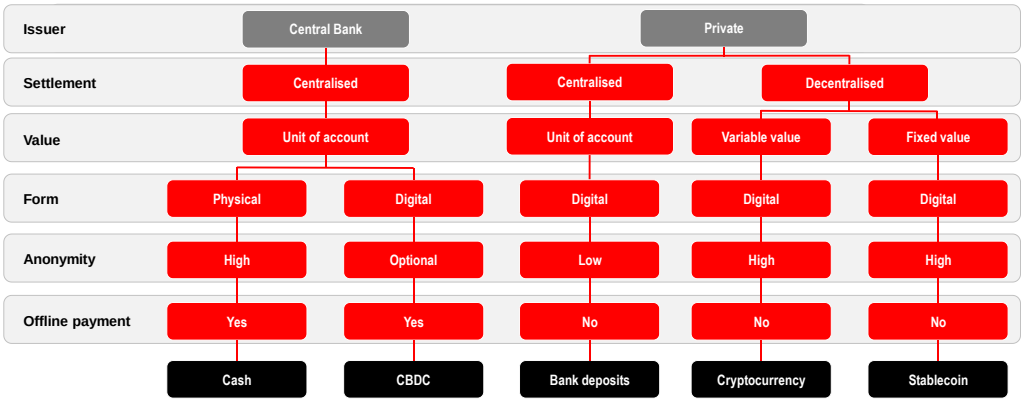
4. A less technical comparison of payment tools

Payment method	CBDC (e-CNY as an example)	Alipay/WeChat Pay	Diem (formerly known as Libra)	Bitcoin	Bank deposits	Cash
Anonymity	Optional	No	Yes	Yes	No	Yes
Efficiency	High	High	High	Low	High	Low
Decentralization	Maybe (at the second layer)	No	Yes	Yes	No	Yes
Price volatility	Low	Low	Low	High	Low	Low
Portability	High	High	High	High	High	Low
Security	High	Medium	High	High	High	Low
Offline Payment	Yes	No	No	No	No	Yes
Technology	Blockchain (maybe at the second layer), QR Codes & Cryptographic technology	Network technology, QR Codes, Cryptographic technology	Consortium blockchain	Public blockchain	Networks	n/a
Programmability	Yes	No	Yes	No	No	No
Progress & Status	Pilot stage	>1bn users each	Development Stage	In Circulation	In Circulation	In Circulation

Source: Bloomberg, Boxmining.com, Sina, HSBC

To show this graphically – chart 5 shows the difference between the different forms of payment.

5. A flow diagram of the different types of payment



Source: HSBC

Developments in new forms of private money may make central banks speed up how quickly they develop CBDCs

Whilst these payment methods are all independent, the developments in one may influence the speed of adoption of others. For example, as cash usage declines, all forms of digital payments could see increased adoption. For some central banks concerned about payments moving into this realm, a greater use of cryptocurrencies or stablecoins could see them increase the speed at which they develop central bank digital currencies.

Before we can think about what the implications of these new forms of digital currencies could be, we first need to look at them a little more closely.

Cryptocurrencies

Bitcoin and other cryptocurrencies have featured increasingly in the media spotlight in recent years. Bitcoin's price has risen enormously – back in 2012, it was trading at roughly USD10: it has recently hit USD60,000. A USD250 investment would have made you a millionaire in just over eight years if you'd been willing to hold (or hodl, as the Bitcoin parlance goes[3]).

[3] The phrase hodl has become synonymous with holding onto cryptocurrencies – it originated on 18 December 2013 when a drunken trader with the username GameKyuubi posted on a Bitcointalk forum: "I AM HODLING".

Bitcoin is the poster child of the cryptocurrency universe, which now includes more than 4,000 different ones – many with different purposes – be it as a means of payment, a store of value, or a network on which to build applications or to store digital collectibles such as artwork. However, many of these cryptocurrencies are not as commonly used or traded.

To understand what they could mean for the broader economy, we first need to look at the different types and how they are used.

How can cryptocurrencies be used?

It's important to understand that many cryptocurrencies, or tokens, aren't primarily designed as a means of payment

Most cryptocurrencies are designed to have a primary use case, but many of those aren't currencies in the traditional sense. As a result, many are known as crypto tokens or coins, rather than cryptocurrencies. There are four main uses: payments, store of value, applications, or asset storage – and how they are used is a key determinant of how they will influence the broader economy and policy making. For some, the distinction isn't so clear, and they can be placed in one or more of these categories.

Payments

The original idea behind cryptocurrencies was that they could be used for transactions in a way that would be secure and away from the traditional financial system. But being outside the system led to concern[4] in some quarters about the extent to which they could be used for illegal transactions and money laundering. However, as more vendors have accepted cryptocurrencies, those concerns have diminished to a degree[5].

Being used as a means of payment was the original idea behind Bitcoin[6]. It has been accepted as a means of payment by some retailers, but has not gained widespread payments usage because transactions cannot be processed quickly or cheaply enough in sufficient numbers. Table 6 shows the comparison in terms of network size and transaction cost between a few leading cryptocurrencies and more traditional means of payment.

6. Can cryptocurrencies be used as mass means of payment today?

	Cash	Visa	Bitcoin (BTC)	Ethereum (ETH)	Ripple (XRP)
Possible payments per second	Unlimited	c1700	7	30 (ETH 2.0 aims to handle 100k)	1500-50,000
Transaction cost	Zero*	c1.5%	USD15-20 (Feb 2021)	cUSD20 (Feb 2021), although can be much higher in times of network stress	USD0.00006

Source: HSBC, Ripple, Visa, Coindesk. Note: *while cash has a zero transaction fee to make the transaction, cash payments incur a number of relatively fixed costs such as storage, counting and processing, making the transaction cost a function of how much it is used. As cash usage declines, the marginal cost of receiving that payment rises.

Transaction fees can be high for some cryptocurrencies because they require offering a reward for the mining process. For cryptocurrencies that cannot process a large number of transactions quickly, these costs can be extremely high – and if a transaction needs to happen quickly – for example at a time of market stress – a higher fee can be offered in order to get priority in the queue. Ethereum transaction fees (known as 'gas' fees on the network) have been above USD100 per transaction at times. For those cryptocurrencies where there is no mining involved, such as Ripple (XRP), or stablecoins (discussed in more detail below), transaction fees are much lower.

[4] Sex, drugs, and bitcoin: How much illegal activity is financed through cryptocurrencies?, Sean Foley, Jonathan R. Karlsen, Tālis J. Putniņš, January 2018
[5] The False Narrative Of Bitcoin's Role In Illicit Activity, Forbes, 19 January 2021
[6] See Satoshi Nakamoto's White Paper: Bitcoin: A Peer-to-Peer Electronic Cash System, published 31 October 2008.

Volatility has weighed on widespread adoption for payments too

But beyond the issues of transaction fees, the volatility of cryptocurrencies has deterred many from using them as a means of payment as the end value received by the seller could be quite different to what they thought they had been expecting to receive. Even Ripple (XRP), a cryptocurrency with low transaction costs has seen its price move by more than 10% in a short space of time in recent months. Its price was 4x more volatile than the S&P500 in 2020.

In the 2021 Global Crypto User Index, when asked for their top three reasons for investing in crypto, 55% of users cited long-term investment, 38% distrust of the financial system, and 31% short-term trading opportunities[7], suggesting that many owners don't see cryptocurrencies primarily as a means of payment.

Store of value

More investors are considering the role in portfolios

As a result of the transactions fees for Bitcoin, many have turned to advocating its properties as 'digital gold', a store of value against high inflation or concerns about the sustainability of fiat currency[8]. However, a cryptocurrency held for this purpose would be zero-yielding and have little practical use, whilst being open to a high level of volatility that may deter people from using it as a store of value. ESG concerns, given the high energy costs may weigh on appetite from some investors[9].

Despite that, this function has gathered more attention in recent weeks on the news that Tesla has put USD1.5bn of its reserves into Bitcoin[10] and more investors are suggesting that cryptocurrencies can serve a purpose in terms of portfolio construction, partly by replacing gold[11]. The case for using cryptocurrencies for this purpose is built on portfolio diversification properties and a conviction in the price increasing over the longer term, and more asset managers, including Blackrock, are looking at the space more seriously[12].

Applications

Many tokens can be used for a range of processes, although widespread use cases are limited for now

Some cryptocurrencies, such as Ethereum, use technology known as smart-contracts to allow developers to build and launch their own decentralized applications. These applications can vary, from games to proof of ownership. Proponents argue that smart contracts could be used to speed up transactions within trade finance, housing transactions, or insurance markets as these smart contracts could cut transaction times and be more secure than using traditional forms of contracts.

Within this, decentralized finance (or De-Fi) has been a growing area. The idea is to use blockchain technology from simple transactions to more complex financial ones. This could include loans, insurance, crowdfunding, or betting markets, and in the simplest sense allows these transactions to take place without a middleman.

However, use cases have so far been relatively small scale – owing to the capacity limits within Ethereum or the limited usage of other networks. This could change as network capacities increase, other cryptocurrencies gain prominence, and new projects are launched. But already the most common form of De-Fi is stablecoins, which are discussed in more detail below. An emerging example is for so-called flash loans, which are issued instantly by a lender without needing checks. If a borrower defaults, all transactions in the chain (i.e. payments made by the borrower with the flash loan funds) simply reverse. For now, the biggest use case is in market arbitrage, but these sorts of innovations may find broader use cases in the coming years. *Example tokens include: ETH, ADA, LINK*

---

[7] 2021 Global Crypto User Index, Binance Research, 28 January 2021
[8] Beyond digital gold: unlocking the true value of bitcoin, City AM, 11 December 2020
[9] Bitcoin Is an Incredibly Dirty Business: This is virtual money with a real carbon footprint, Bloomberg, 26 January 2021
[10] Tesla sends bitcoin to record high with $1.5bn investment, FT, 8 February 2021
[11] Bitcoin hits records as US financial giants embrace cryptocurrency, Financial Times, 11 February 2021
[12] $8.7 Trillion Asset Manager BlackRock Is Exploring Bitcoin As Institutions Flood Crypto, Forbes, 17 February 2021

Non-fungible tokens (NFTs) – crypto collectibles

The soaring prices of some digital art has brought NFTs into the mainstream

In a combination of both applications and stores of value, one of the newest use cases for cryptocurrencies is within digital assets, known as non-fungible tokens or NFTs. An item – usually a collectible or a piece of art – is minted as a token that is not interchangeable, meaning that it acts as a proof of ownership and authenticity. These assets have become popular in the past year, with sales of digital characters, artworks, and basketball moments reaching millions of dollars per day on digital auction houses. For example, the sale of Beeple's artwork, 'Everydays: The First 5000 Days' for more than USD69m at Christie's auction house gathered much attention[13]. However, going forwards, this sort of technology could find more real world use cases, such as in ticketing of events to fight touting, scalping or fraud. *Example tokens are ENJ, FLOW, MANA.*

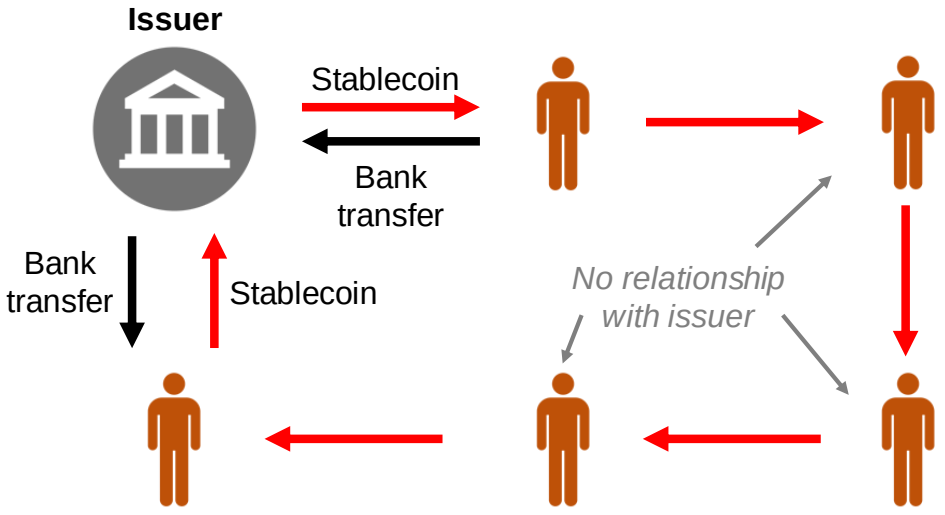
What is a stablecoin?

Stablecoins remove the volatility issues associated with cryptocurrencies

Stablecoins are a subset of cryptocurrencies designed to address the issue of price volatility. This is because they are pegged to the value of other assets such as USD or gold. This allows them to benefit from the transparency, security, and privacy of cryptocurrencies (as the same technology is used) without absorbing the risks of sudden, extreme, and often unpredictable price shocks. This makes them more functional in terms of facilitating transactions.

There are four types of stablecoins, which are all collateralised differently: fiat, commodity, crypto, and non-collateralised. The most common is fiat-collateralised, and it is very simple: when a consumer wishes to redeem their coins for fiat currency the entity managing the stablecoins takes out the equivalent fiat money value of the stablecoins from their reserves and sends it to the user's bank account. USD Coin (USDC), a stablecoin that runs on Ethereum, allows for payments between Ethereum wallets at a guaranteed level of USD and has grown in popularity given this use case.

7. A simple guide to how a stablecoin works



Source: HSBC

Stablecoins are particularly useful for overseas payments as they require no foreign exchange fees and remove currency volatility from the transaction. They also allow for self-executing contracts without any third party or central authority executing them, and the transactions remain transparent, traceable, and irreversible; ideal for regular payments such as rent or salaries across borders.

[13] Buyer behind $69m record-breaking art sale revealed, CNN, 13 March 2021

Stablecoins can therefore be extremely useful for remittances, or even cross-border payments where workers wish to keep some form of anonymity for personal privacy reasons.

There needs to be a trust in the network for stablecoins to be widely used

However, they have their drawbacks, notably surrounding the stability of the networks. One of the most popular stablecoins is Tether, the third-largest trading cryptocurrency by market capitalisation. The US Department of Justice is investigating whether Tether holds sufficient reserves of US dollars to back up all of the tokens it has issued. As such, stablecoins operated by large companies will require regular audits and perhaps even a regulator to protect financial stability and consumers' deposits in case of any network failures. Whilst the technology could provide a legitimate solution to cross-border payments, there are still risks attached to them.

The Diem association (formerly Libra)

To get around this issue, the most famous proponent of stablecoins, the Diem Association (the consortium set up by Facebook), aims to use a centralised model – relying on the trust in the association itself. Originally, the plan was for Diem to be backed by a basket of currencies, but due to globally regulatory concerns that has now changed – and the association plans to launch a series of single-currency backed coins.

Diem's long-term plan is to roll out stablecoins backed with single currencies e.g. EUR, USD, GBP, as well as a 'digital composite' of all of its tokens. The initial launch will only include a single coin backed one-for-one with the US Dollar[14].

Next, we look at what central banks are doing in the space.

[14] Facebook's Libra currency to launch next year in limited format, Financial Times, 27 November 2020

Central bank digital currencies

- Central banks are starting to think more about digital forms of payment
- China's PBoC and Sweden's Riksbank are furthest ahead…
- …but interest in the space is growing

What are central banks doing in this space?

More central banks are looking at CBDCs

Given the rise in digital currency alternatives and the demise of cash usage, it's no surprise that more central banks are taking a greater interest in the space. 2020 saw a lot of progress from central banks all over the world, with the major ones taking more of an interest for the first time – partly due to the rapid decline in cash usage during the pandemic and partly due to improvements in underlying technologies and the greater usage of private forms of digital payments. This push has come from central banks themselves – in an attempt to modernise the payments infrastructure.

Why?

This is for a variety of reasons, from improving the payments system, to financial inclusion

The BIS[15] shows that central banks in the developed world are researching central bank digital currencies (CBDCs) to promote the safety and robustness of the payments system, or domestic payments efficiency, while for emerging market economies financial inclusion is an important motivation. A CBDC could, in theory, provide a highly efficient and almost costless means of payment, both peer-to-peer and at point-of-sale. A CBDC can co-exist with current means of payment, and would most-likely not completely replace cash given the demands for paper money from certain pockets of society.

Milton Friedman argued[16] in 1960, that: "something like a moderately stable monetary framework seems an essential prerequisite for the effective operation of a private market economy. It is dubious that the market can by itself provide such a framework. Hence, the function of providing one is an essential governmental function on a par with the provision of a stable legal framework." If central banks agree that this still holds in the digital age, then as alternative forms of digital payments grow, they will need to continue to play a pivotal role.

Amongst bigger central banks, the two leaders in this space are China's PBoC and Sweden's Riksbank, but more central banks across the world are putting time and energy into research projects in the space. In Sweden, cash is no longer universally accepted and accessible, and so the central bank is thinking about whether it needs to offer an alternative. The PBoC is thinking about tackling the decline of cash usage, addressing challenges posed by foreign digital forms of money, increasing oversight of money flows to improve policymaking, and to raise the efficiency of cross-border payments and pave the way for RMB internationalisation.

[15] Ready, steady, go? – Results of the third BIS survey on central bank digital currency, BIS, January 2021
[16] M Friedman, A program for monetary stability, Fordham University Press, 1960

Some design choices could create some unintended problems

Whilst these are the reasons to explore CBDCs, there are many drawbacks – notably the risks that they could create for the commercial banking system. If customers could hold their CBDCs directly with the central bank, there would be little incentive to keep a commercial bank account, unless the commercial bank were to offer higher interest rates. This may make them less profitable (and therefore potentially less willing or able to lend, or they would have to lend at higher rates). We could in theory see more bank runs if switching from one form of digital money to another is very easy. These issues have to be considered when working on the design of a CBDC and are why a direct approach is unlikely to be eventually adopted.

Aside from Sweden and China, progress is still relatively slow – but that could change as these other forms of digital payments grow in prominence. Whilst today cryptocurrencies are not widely used for payments and stablecoins are being used in a few specific cases, any growth in their uses may encourage more central banks to accelerate their plans to issue their own CBDCs in order to satisfy some of the demand for a new form of digital payment.

What are the leaders doing?

Sweden and China lead the way in terms of pilots to follow

Whilst the Bahamas launched its Sand Dollar to the general public in October 2020, most of the progress from larger central banks is coming from China's PBoC (called e-CNY) and Sweden's Riksbank (called e-Krona). The PBoC has made significant progress towards an eventual launch of e-CNY – more than 10,000 merchants participated in domestic trials in 2020. The testing pace is likely to accelerate this year, rolling out across more cities.

Sweden is carrying out a pilot to assess how an e-Krona could work in future. It aims to create "a digital krona that is simple and user-friendly and, at the same time, complies with critical requirements for security and performance". Both central banks could be in a position to issue a CBDC in 2021.

Whilst the tests and pilots from these two central banks won't necessarily generate a template for other central banks to follow, they will give some indications of how a CBDC could look and the impact that it could have.

What does this suggest about what a CBDC could look like?

In practice, the concepts being used in China and Sweden are very similar – suggesting that this approach could be the dominant one going forwards.

An indirect approach looks to be more likely

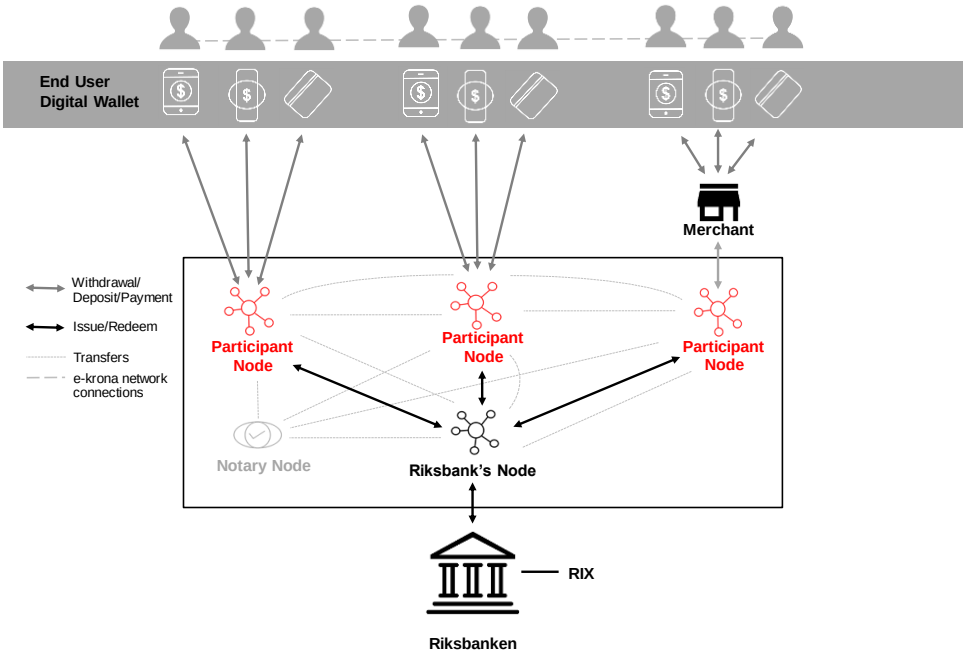
Both central banks have opted for **an indirect approach** – which means that CBDC would be issued by the central bank to nodes within the network – be it banks or online payment service providers. Both central banks are expecting their CBDCs to be **widely available**. No decision has been made by either over whether a CBDC will be issued via an account or a token. The Riksbank has suggested that a token-based approach may be no better than an account-based approach in terms of replicating the qualities of cash, such as being peer-to-peer, offline, or anonymous[17]. Meanwhile Agustín Carstens at the BIS[18] has argued that a token-based approach may not provide sufficient levels of trust and security, sensing that an **account-based approach is more likely**, but both are plausible.

The Riksbank's proposed architecture is in chart 8, and the e-Krona network will be based on **DLT technology**. Because the network will be private and only accessible for participants approved by the Riksbank, the energy costs will be akin to current payment networks and allow for highly efficient transactions. Another key angle is for the technology involved to ensure that

[17] On the possibility of a cash-like CBDC, Sveriges Riksbank Staff memos, February 2021.
[18] Agustín Carstens, Digital currencies and the future of the monetary system, 27 January 2021

payments can be made 24/7, offline – something that could be possible – based on the technological solution proposed[19].

8. Sweden's Riksbank's pilot conceptual architecture for a CBDC



Source: Sveriges Riksbank, HSBC

Other central banks will start to be more involved in the coming years

Of course, these are just the two central banks that are furthest ahead in this journey. Their progress, as well as other digital currency developments and the continuing decline in cash usage, accelerated by COVID-19, is spurring other central banks to look much more closely at the issue. In the second half of 2020 there were key reports released by both the ECB[20] and the BoJ[21] following closely behind a joint report[22] from seven major central banks and the BIS that outlines the foundational principles and core features of CBDCs. The progress in this space will be worth watching in the coming months and years.

Not all central banks can be expected to issue their own CBDCs, at least not soon. Even Sweden's pilot programme clearly states that there is no confirmed decision over whether to issue a CBDC at this stage, and other central banks may struggle to work out a solution that improves the current financial infrastructure without creating additional risks. While improvements in the underlying technologies and big steps from the likes of Sweden and China may make it more likely, according to the BIS, 60% of central banks indicated that the pandemic has not changed their priority or preference for issuing a CBDC and just 14% of the world's central banks are currently engaged in a pilot based on the same BIS survey.

[19] See, for example: Towards a Two-Tier Hierarchical Infrastructure: An Offline Payment System for Central Bank Digital Currencies, Mihai Christodorescu et al, December 2020
[20] Report on a digital euro, ECB, October 2020
[21] The Bank of Japan's Approach to Central Bank Digital Currency, October 2020
[22] Central banks and BIS publish first central bank digital currency (CBDC) report laying out key requirements, BIS, 9 October 2020.

Internationalisation?

One key question is whether CBDCs will just be used domestically or internationally. It is possible that the e-CNY could become used outside China – especially in those countries that may have weaker institutions, high inflation, and economic linkages with China, contingent on:

(i) the e-CNY being at the forefront of digital currencies when it comes to user friendliness, security, and settlement technology;

(ii) the Chinese authorities further relaxing capital restrictions, in particular, to allow capital outflows more freely; and

(iii) international acceptance of the RMB and e-CNY rising further.

If CBDCs work internationally, this could have ramifications for currency markets

For some central banks, this is an important component. The ECB, for example, has said that the initial aim of a CBDC would be to complement cash within the eurozone for domestic residents – households and firms.

But the ECB said in a report about the digital euro that "it should potentially be accessible outside of the euro area in a way that is consistent with the objectives of the Eurosystem and convenient to non-euro area residents." Otherwise, the ECB said the international role of the EUR could weaken at the expense of other CBDCs. Recall, strengthening EUR internationalisation is an official policy of EU institutions and a digital currency appears to be part of this strategy.

The ECB believes the international role of the EUR is stable but its composite measure[23] also shows that this has been weakening for more than the past decade. If CBDCs are eventually designed to be international, then this could have clear currency market implications.

Next, we look at what all of this could mean for the economy and policy.

[23] The international role of the euro, ECB, June 2020

How will the economy and policy be affected?

- Getting people banked could be the biggest impact of new forms of digital payments
- At least for now, the impact of cryptocurrencies on the economy is limited…
- …and CBDCs could have a bigger impact, but a lot will depend on how they are designed

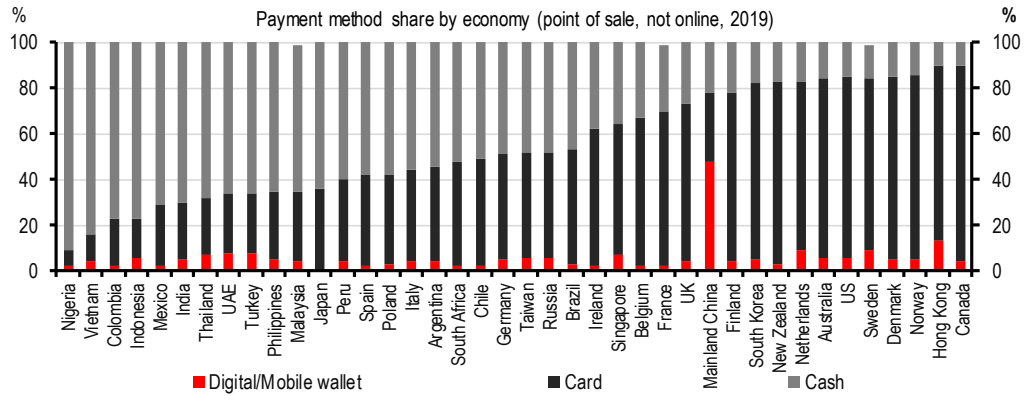
Digitising matters most

Getting people banked could help the global economy

First, while all of the excitement over digital payments technologies has been focused on cryptocurrencies and CBDCs, the implications of getting many of the millions of unbanked people across the world access to digital payments is likely to have a far greater near-term economic impact. Increasing access to digital payments in the emerging world could help to lift growth by providing access to savings vehicles and credit, and streamlining businesses, as well as helping to increase tax takes and cut crime.

The share of payments made in cash in many of the economies on the left hand side of chart 9 could fall sharply in the coming decade, with the most progress likely to be made in terms of mobile payments given the growing access to smartphones across the world and the improvements in the technology used for this form of payment.

9. Many parts of the world still rely on cash



Source: WorldPay

However, this process could be helped by these new forms of payment. We could see cryptocurrencies become more widely adopted in some emerging markets (particularly if challenges over volatility and transaction speed can be ironed out), facilitating more digital payments. We could see stablecoins play a bigger role in remittances, which may help to digitise more domestic payments in emerging markets. Across the world, CBDCs could allow more people access to digital money than ever before and could make digital payments even cheaper – incentivising their usage.

Will cryptocurrencies matter to the economy?

How technology and adoption rates develop will be key to follow

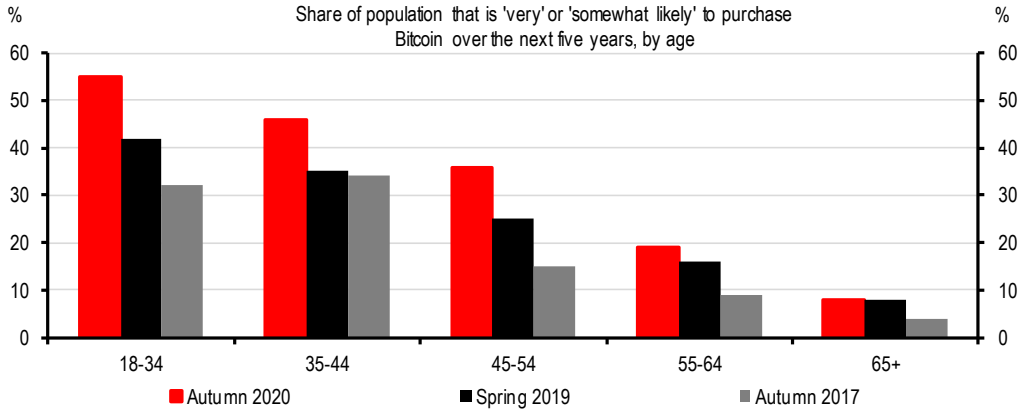
A lot of this will come down to the progress made in terms of blockchain technology in the coming years. Right now, many cryptocurrencies don't have the capacity to process enough payments quickly enough to play a substantial role in global payments, while many businesses are also reluctant to take payments while these instruments are so volatile. This could of course change in future if cryptocurrency markets become much more stable.

In some emerging markets, this impact could be sooner rather than later, however, given that a greater share of the population have or use cryptocurrencies today, according to Statista's Global Consumer Survey, which reports that the main reason for use is for overseas payments, although local spending is becoming more regular – particularly in emerging economies where use and ownership of cryptocurrencies is reported to be higher than in the developed world.

How cryptocurrencies are used will matter to how we have to think about the macro impact

Of course, the role of cryptocurrencies could change over time. As today's younger generations, who are more willing to own or use cryptocurrencies, become a bigger share of the world's consumers, we could see more widespread adoption and trust in using cryptocurrencies as a means of payment. Many polls[24] have suggested that younger age groups are more willing to buy Bitcoin and more likely to be optimistic about its future uses. So while widespread practical usage that could replace more traditional means of payment may be some way off, how younger generations interact with these new technologies may be telling about future adoption rates.

10. Younger generations may be more likely to buy or use cryptocurrencies



Source: Blockchain Capital/The Harris Poll. Note: Data based on US respondents.

But away from payments – we could see a much wider adoption of cryptocurrencies as a store of value or as an investment asset. This segment could continue to grow even without improvements in the underlying technology, particularly amongst younger populations: in the latest Blockchain Capital poll, of those aged 18–34: 38% prefer Bitcoin to government bonds

[24] Such as a regular survey commission by Blockchain Capital facilitated by The Harris Poll

(up from 30% in Spring 2019), 35% prefer Bitcoin to stocks (up from 27% in Spring 2019), 33% prefer Bitcoin to real estate (up from 24% in Spring 2019), and 31% prefer Bitcoin to gold (up from 22% in Spring 2019). Of course, these numbers could be supported by the recent run-up in prices, and attitudes may change depending on future price developments.

This, of course, would have far greater implications for assets that are typically seen as a store of value than for the economy. The price of gold or its share in portfolios does little in terms of affecting global economic activity – and the same may well apply to cryptocurrencies if this ends up being the primary use.

Decentralised finance (De-Fi)

Could we see more use cases through De-Fi?

The role of decentralised finance remains to be seen. While many within the crypto space are, unsurprisingly, extremely bullish on the possibility of De-Fi replacing some more traditional financial infrastructure, this may be some way off – as fast enough networks and highly trusted applications will be needed to get to widespread adoption. A key step on that path could be the upgrade from Ethereum 1.0 to Ethereum 2.0 through 2021 and 2022, which will allow more transactions to go through the network. If this were to happen, more traditional financial activities within the likes of insurance, housing transactions, and lending could be disrupted – but the nature of how quickly and when will depend heavily on the progress on the technology front.

Stablecoins

We could see stablecoins gain more prominence in some forms of payment, but because of the risks associated with the stability and sustainability of the networks, right now it may be hard for widespread adoption beyond a few use cases for international payments or between cryptocurrency wallets. However, this could change – particularly if there is more faith in the networks. If we were to see more widespread usage, the focus in terms of policy may well be on supervisory initiatives, as discussed below.

The impacts on central bank policy?

In terms of central bank digital currencies, many of the possible implications for the economy – the impact on monetary policy transmission, the likelihood of negative rates, and whether any end users in the economy notice a difference from current payment systems will depend on the choices made by central banks.

Faster and cheaper payments may be the biggest benefit for now

If an indirect approach is chosen – whereby users still interact with commercial banks, then the macro implications of the introduction of a CBDC may be very limited. Most people wouldn't notice a difference in their day to day banking, but payments would be faster and essentially costless to all parties (whereas today, while consumers may not typically pay for digital payments, retailers incur a charge which would be minimal or zero within a CBDC system), which may act as a small efficiency gain for the economy. If a CBDC allows banks to offer accounts based on CBDC to more people (for example, such as making it easier to set up a bank account without a fixed address or ID) then we could see a much **faster adoption of digital payments** – a notable benefit for many emerging market economies with low levels of financial inclusion.

The impact on monetary policy will depend on design decisions

Monetary policy is an interesting space. If a CBDC is made to be interest bearing, then this could make negative interest rates far easier to implement – as the interest rate on the CBDC could be changed easily. But equally, a non-interest bearing CBDC could make negative rates far less likely due to the existence of zero-yielding central bank money. Of course, any existence of caps or limits could counteract that issue. At present, it looks most likely that a CBDC would **not be interest bearing,** based on pilots in Sweden and China. Either decision is unlikely to have an impact on the viability of asset purchase programmes.

Ongoing research and pilots suggest that a CBDC is more likely to be indirect (via commercial banks rather than direct with the central bank), but if this approach isn't followed, and individuals and businesses are able to essentially bank directly with the central bank, then we may see far greater economic implications. We could see a far greater impact on the commercial banking system, which would have to compete with CBDC accounts, and this could bring with it many risks involving financial stability, such as increasing the risk of bank runs from commercial banks. Based on the pilots and research, it seems unlikely that this option would to be adopted at this time.

Regulatory issues

Greater usage may create some regulatory challenges

When thinking about the other forms of digital payments, the challenge is much more likely to be associated with risks in terms of financial stability or regulatory issues, such as tackling fraud and money laundering. If stablecoins and cryptocurrencies that are outside of the traceable financial system pose these risks, then central banks may have to think about how these could be addressed. The BIS[25] has suggested, for example, that supervisory requirements could be embedded into stablecoin systems, allowing for "embedded supervision" where compliance is automatically monitored by reading the ledger of the stablecoin network.

This may be harder to do with other digital assets such as cryptocurrencies, which are much more anonymous, but most global central banks aren't too worried about this at the moment: the BIS' 2021 survey on central bank digital currency[26] found that the majority of respondents expected cryptocurrencies to be only trivially used or used by niche groups at both the domestic and cross-border level. This could, of course, change, and will be worth monitoring – as widespread usage for payments could make central banks adapt more quickly – either in terms of regulation over the usage of cryptocurrencies or development of CDBCs.

Summary

Despite huge changes happening in the payments space, the impact on the economy may prove to be relatively limited – at least for now.

This could change over time – if cryptocurrencies become more widely used for payments, more central banks may look into accelerating their plans with regards to CBDCs. If stablecoins become more commonly used, how they are regulated may change.

Following what happens in this space will be key in the coming years

The development of CBDCs could have the biggest impact on the way we think about money. But the current pilots in China and Sweden suggest a solution that most people wouldn't notice as being any different from the system they use today, although transaction times and costs may be cut, and the system may be more robust. But, if over time research and pilots lean towards a more direct approach (however unlikely that is), where retail customers bank directly with the central bank, then the implications could be much greater. If central banks opt to make a CBDC interest bearing, it could influence policies such as negative rates going forwards.

That is why following developments in how CBDCs, cryptocurrencies, and stablecoins progress in terms of their underlying technologies and how they are used is going to be important.

[25] Stablecoins: risks, potential and regulation, BIS, November 2020
[26] Ready, steady, go? – Results of the third BIS survey on central bank digital currency, BIS, January 2021

Disclosure appendix

Analyst Certification

The following analyst(s), economist(s), or strategist(s) who is(are) primarily responsible for this report, including any analyst(s) whose name(s) appear(s) as author of an individual section or sections of the report and any analyst(s) named as the covering analyst(s) of a subsidiary company in a sum-of-the-parts valuation certifies(y) that the opinion(s) on the subject security(ies) or issuer(s), any views or forecasts expressed in the section(s) of which such individual(s) is(are) named as author(s), and any other views or forecasts expressed herein, including any views expressed on the back page of the research report, accurately reflect their personal view(s) and that no part of their compensation was, is or will be directly or indirectly related to the specific recommendation(s) or views contained in this research report: James Pomeroy, Paul Mackel and Davey Jose

Important disclosures

Foreign exchange: Basis for financial analysis

This document has been prepared and is being distributed by the Research Department of HSBC and is not for publication to other persons, whether through the press or by other means.

This document is for information purposes only and it should not be regarded as an offer to sell or as a solicitation of an offer to buy the securities or other investment products mentioned in it and/or to participate in any trading strategy. Advice in this document is general and should not be construed as personal advice, given it has been prepared without taking account of the objectives, financial situation or needs of any particular investor. Accordingly, investors should, before acting on the advice, consider the appropriateness of the advice, having regard to their objectives, financial situation and needs. If necessary, seek professional investment and tax advice.

Certain investment products mentioned in this document may not be eligible for sale in some states or countries, and they may not be suitable for all types of investors. Investors should consult with their HSBC representative regarding the suitability of the investment products mentioned in this document and take into account their specific investment objectives, financial situation or particular needs before making a commitment to purchase investment products.

The value of and the income produced by the investment products mentioned in this document may fluctuate, so that an investor may get back less than originally invested. Certain high-volatility investments can be subject to sudden and large falls in value that could equal or exceed the amount invested. Value and income from investment products may be adversely affected by exchange rates, interest rates, or other factors. Past performance of a particular investment product is not indicative of future results.

HSBC believes that investors utilise various disciplines and investment horizons when making investment decisions, which depend largely on individual circumstances such as the investor's existing holdings, risk tolerance and other considerations. HSBC's currency trade ideas on deliverable FX forwards (DF) or non-deliverable FX forwards (NDF) are usually identified on a time horizon of up to three months, although HSBC reserves the right to extend this time horizon on a discretionary, trade-by-trade basis.

HSBC believes an investor's decision to buy or sell an instrument should depend on individual circumstances such as the investor's existing holdings and other considerations. Different securities firms use a variety of terms as well as different systems to describe their recommendations. Investors should carefully read the definitions of the recommendations used in each research report. In addition, because research reports contain more complete information concerning the analysts' views, investors should carefully read the entire research report and should not infer its contents from the recommendation. In any case, recommendations should not be used or relied on in isolation as investment advice.

Definitions for currency trades on DFs and NDFs

Buy: refers to buying the first currency in the named pair in exchange for the second currency in the named pair.

Sell: refers to selling the first currency in the named pair in exchange for the second currency in the named pair.

The tenor of the instrument will be denoted and will refer to a settlement date relative to the opening date of the trade idea e.g. 1m refers to a settlement date 1 month forward from the open date of the trade idea. NDF trades normally fix two working days prior to the settlement date.

Distribution of currency trades

The nature of foreign exchange forward trade ideas is such that there will always be an equal number of buy and sell trades (buying one currency in exchange for selling another), both outstanding and historically.

Equities: Stock ratings and basis for financial analysis

HSBC and its affiliates, including the issuer of this report ("HSBC") believes an investor's decision to buy or sell a stock should depend on individual circumstances such as the investor's existing holdings, risk tolerance and other considerations and that investors utilise various disciplines and investment horizons when making investment decisions. Ratings should not be used or relied on in isolation as investment advice. Different securities firms use a variety of ratings terms as well as different rating systems to describe their recommendations and therefore investors should carefully read the definitions of the ratings used in each research report. Further, investors should carefully read the entire research report and not infer its contents from the rating because research reports contain more complete information concerning the analysts' views and the basis for the rating.

From 23rd March 2015 HSBC has assigned ratings on the following basis:

The target price is based on the analyst's assessment of the stock's actual current value, although we expect it to take six to 12 months for the market price to reflect this. When the target price is more than 20% above the current share price, the stock will be classified as a Buy; when it is between 5% and 20% above the current share price, the stock may be classified as a Buy or a Hold; when it is between 5% below and 5% above the current share price, the stock will be classified as a Hold; when it is between 5% and 20% below the current share price, the stock may be classified as a Hold or a Reduce; and when it is more than 20% below the current share price, the stock will be classified as a Reduce.

Our ratings are re-calibrated against these bands at the time of any 'material change' (initiation or resumption of coverage, change in target price or estimates).

Upside/Downside is the percentage difference between the target price and the share price.

Prior to this date, HSBC's rating structure was applied on the following basis:

For each stock we set a required rate of return calculated from the cost of equity for that stock's domestic or, as appropriate, regional market established by our strategy team. The target price for a stock represented the value the analyst expected the stock to reach over our performance horizon. The performance horizon was 12 months. For a stock to be classified as Overweight, the potential return, which equals the percentage difference between the current share price and the target price, including the forecast dividend yield when indicated, had to exceed the required return by at least 5 percentage points over the succeeding 12 months (or 10 percentage points for a stock classified as Volatile*). For a stock to be classified as Underweight, the stock was expected to underperform its required return by at least 5 percentage points over the succeeding 12 months (or 10 percentage points for a stock classified as Volatile*). Stocks between these bands were classified as Neutral.

*A stock was classified as volatile if its historical volatility had exceeded 40%, if the stock had been listed for less than 12 months (unless it was in an industry or sector where volatility is low) or if the analyst expected significant volatility. However, stocks which we did not consider volatile may in fact also have behaved in such a way. Historical volatility was defined as the past month's average of the daily 365-day moving average volatilities. In order to avoid misleadingly frequent changes in rating, however, volatility had to move 2.5 percentage points past the 40% benchmark in either direction for a stock's status to change.

Rating distribution for long-term investment opportunities

As of 17 March 2021, the distribution of all independent ratings published by HSBC is as follows:

Buy	57%	(30% of these provided with Investment Banking Services)
Hold	34%	(27% of these provided with Investment Banking Services)
Sell	9%	(22% of these provided with Investment Banking Services)

For the purposes of the distribution above the following mapping structure is used during the transition from the previous to current rating models: under our previous model, Overweight = Buy, Neutral = Hold and Underweight = Sell; under our current model Buy = Buy, Hold = Hold and Reduce = Sell. For rating definitions under both models, please see "Stock ratings and basis for financial analysis" above.

For the distribution of non-independent ratings published by HSBC, please see the disclosure page available at http://www.hsbcnet.com/gbm/financial-regulation/investment-recommendations-disclosures.

To view a list of all the independent fundamental ratings/recommendations disseminated by HSBC during the preceding 12-month period, and the location where we publish our quarterly distribution of non-fundamental recommendations (applicable to Fixed Income and Currencies research only), please use the following links to access the disclosure page:

Clients of Global Research and Global Banking and Markets: www.research.hsbc.com/A/Disclosures

Clients of HSBC Private Banking: www.research.privatebank.hsbc.com/Disclosures

HSBC and its affiliates will from time to time sell to and buy from customers the securities/instruments, both equity and debt (including derivatives) of companies covered in HSBC Research on a principal or agency basis or act as a market maker or liquidity provider in the securities/instruments mentioned in this report.

Analysts, economists, and strategists are paid in part by reference to the profitability of HSBC which includes investment banking, sales & trading, and principal trading revenues.

Whether, or in what time frame, an update of this analysis will be published is not determined in advance.

Non-U.S. analysts may not be associated persons of HSBC Securities (USA) Inc, and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with the subject company, public appearances and trading securities held by the analysts.

Economic sanctions imposed by the EU, the UK, the USA, and certain other jurisdictions generally prohibit transacting or dealing in any debt or equity issued by Russian SSI entities on or after 16 July 2014 (Restricted SSI Securities). Economic sanctions imposed by the USA also generally prohibit US persons from purchasing or selling publicly traded securities issued by companies designated by the US Government as “Communist Chinese military companies” (CMCs) or any securities that are derivative of, or designed to provide investment exposure, to the targeted CMC securities (collectively, Restricted CMC Securities). This report does not constitute advice in relation to any Restricted SSI Securities or Restricted CMC Securities, and as such, this report should not be construed as an inducement to transact in any Restricted SSI Securities or Restricted CMC Securities.

For disclosures in respect of any company mentioned in this report, please see the most recently published report on that company available at www.hsbcnet.com/research. HSBC Private Banking clients should contact their Relationship Manager for queries regarding other research reports. In order to find out more about the proprietary models used to produce this report, please contact the authoring analyst.

Additional disclosures

1 This report is dated as at 17 March 2021.

2 All market data included in this report are dated as at close 15 March 2021, unless a different date and/or a specific time of day is indicated in the report.

3 HSBC has procedures in place to identify and manage any potential conflicts of interest that arise in connection with its Research business. HSBC's analysts and its other staff who are involved in the preparation and dissemination of Research operate and have a management reporting line independent of HSBC's Investment Banking business. Information Barrier procedures are in place between the Investment Banking, Principal Trading, and Research businesses to ensure that any confidential and/or price sensitive information is handled in an appropriate manner.

4 You are not permitted to use, for reference, any data in this document for the purpose of (i) determining the interest payable, or other sums due, under loan agreements or under other financial contracts or instruments, (ii) determining the price at which a financial instrument may be bought or sold or traded or redeemed, or the value of a financial instrument, and/or (iii) measuring the performance of a financial instrument or of an investment fund.

Disclaimer

Legal entities as at 1 December 2020

'UAE' HSBC Bank Middle East Limited, DIFC; HSBC Bank Middle East Limited, Dubai; 'HK' The Hongkong and Shanghai Banking Corporation Limited, Hong Kong; 'TW' HSBC Securities (Taiwan) Corporation Limited; 'CA' HSBC Securities (Canada) Inc.; 'France' HSBC Continental Europe; 'Spain' HSBC Continental Europe, Sucursal en España; 'Italy' HSBC Continental Europe, Italy; 'Sweden' HSBC Continental Europe Bank, Sweden Filial; 'DE' HSBC Trinkaus & Burkhardt AG, Düsseldorf; 000 HSBC Bank (RR), Moscow; 'IN' HSBC Securities and Capital Markets (India) Private Limited, Mumbai; 'JP' HSBC Securities (Japan) Limited, Tokyo; 'EG' HSBC Securities Egypt SAE, Cairo; 'CN' HSBC Investment Bank Asia Limited, Beijing Representative Office; The Hongkong and Shanghai Banking Corporation Limited, Singapore Branch; The Hongkong and Shanghai Banking Corporation Limited, Seoul Securities Branch; The Hongkong and Shanghai Banking Corporation Limited, Seoul Branch; HSBC Securities (South Africa) (Pty) Ltd, Johannesburg; HSBC Bank plc, London, Tel Aviv; 'US' HSBC Securities (USA) Inc, New York; HSBC Yatirim Menkul Degerler AS, Istanbul; HSBC México, SA, Institución de Banca Múltiple, Grupo Financiero HSBC; HSBC Bank Australia Limited; HSBC Bank Argentina SA; HSBC Saudi Arabia Limited; The Hongkong and Shanghai Banking Corporation Limited, New Zealand Branch incorporated in Hong Kong SAR; The Hongkong and Shanghai Banking Corporation Limited, Bangkok Branch; PT Bank HSBC Indonesia; HSBC Qianhai Securities Limited; Banco HSBC S.A.

Issuer of report
HSBC Bank plc
8 Canada Square, London
E14 5HQ, United Kingdom
Telephone: +44 20 7991 8888
Fax: +44 20 7992 4880
Website: www.research.hsbc.com

This document is issued and approved in the United Kingdom by HSBC Bank plc for the information of its Clients (as defined in the Rules of FCA) and those of its affiliates only. If this research is received by a customer of an affiliate of HSBC, its provision to the recipient is subject to the terms of business in place between the recipient and such affiliate. In Australia, this publication has been distributed by The Hongkong and Shanghai Banking Corporation Limited (ABN 65 117 925 970, AFSL 301737) for the general information of its "wholesale" customers (as defined in the Corporations Act 2001). Where distributed to retail customers, this research is distributed by HSBC Bank Australia Limited (ABN 48 006 434 162, AFSL No. 232595). These respective entities make no representations that the products or services mentioned in this document are available to persons in Australia or are necessarily suitable for any particular person or appropriate in accordance with local law. No consideration has been given to the particular investment objectives, financial situation or particular needs of any recipient.

In the European Economic Area, this publication has been distributed by HSBC Continental Europe or by such other HSBC affiliate from which the recipient receives relevant services

The document is distributed in Hong Kong by The Hongkong and Shanghai Banking Corporation Limited and in Japan by HSBC Securities (Japan) Limited. Each of the companies listed above (the "Participating Companies") is a member of the HSBC Group of Companies, any member of which may trade for its own account as Principal, may have underwritten an issue within the last 36 months or, together with its Directors, officers and employees, may have a long or short position in securities or instruments or in any related instrument mentioned in the document. Brokerage or fees may be earned by the Participating Companies or persons associated with them in respect of any business transacted by them in all or any of the securities or instruments referred to in this document. In Korea, this publication is distributed by either The Hongkong and Shanghai Banking Corporation Limited, Seoul Securities Branch ("HBAP SLS") or The Hongkong and Shanghai Banking Corporation Limited, Seoul Branch ("HBAP SEL") for the general information of professional investors specified in Article 9 of the Financial Investment Services and Capital Markets Act ("FSCMA"). This publication is not a prospectus as defined in the FSCMA. It may not be further distributed in whole or in part for any purpose. Both HBAP SLS and HBAP SEL are regulated by the Financial Services Commission and the Financial Supervisory Service of Korea. This publication is distributed in New Zealand by The Hongkong and Shanghai Banking Corporation Limited, New Zealand Branch incorporated in Hong Kong SAR.

The information in this document is derived from sources the Participating Companies believe to be reliable but which have not been independently verified. The Participating Companies make no guarantee of its accuracy and completeness and are not responsible for errors of transmission of factual or analytical data, nor shall the Participating Companies be liable for damages arising out of any person's reliance upon this information. All charts and graphs are from publicly available sources or proprietary data. The opinions in this document constitute the present judgement of the Participating Companies, which is subject to change without notice. From time to time research analysts conduct site visits of covered issuers. HSBC policies prohibit research analysts from accepting payment or reimbursement for travel expenses from the issuer for such visits. This document is neither an offer to sell, purchase or subscribe for any investment nor a solicitation of such an offer.

HSBC Securities (USA) Inc. accepts responsibility for the content of this research report prepared by its non-US foreign affiliate. The information contained herein is under no circumstances to be construed as investment advice and is not tailored to the needs of the recipient. All US persons receiving and/or accessing this report and intending to effect transactions in any security discussed herein should do so with HSBC Securities (USA) Inc. in the United States and not with its non-US foreign affiliate, the issuer of this report. In Singapore, this publication is distributed by The Hongkong and Shanghai Banking Corporation Limited, Singapore Branch for the general information of institutional investors or other persons specified in Sections 274 and 304 of the Securities and Futures Act (Chapter 289) ("SFA") and accredited investors and other persons in accordance with the conditions specified in Sections 275 and 305 of the SFA. Only Economics or Currencies reports are intended for distribution to a person who is not an Accredited Investor, Expert Investor or Institutional Investor as defined in SFA. The Hongkong and Shanghai Banking Corporation Limited, Singapore Branch accepts legal responsibility for the contents of reports pursuant to Regulation 32C(1)(d) of the Financial Advisers Regulations. This publication is not a prospectus as defined in the SFA. This publication is not a prospectus as defined in the SFA. It may not be further distributed in whole or in part for any purpose. The Hongkong and Shanghai Banking Corporation Limited Singapore Branch is regulated by the Monetary Authority of Singapore. Recipients in Singapore should contact a "Hongkong and Shanghai Banking Corporation Limited, Singapore Branch" representative in respect of any matters arising from, or in connection with this report. Please refer to The Hongkong and Shanghai Banking Corporation Limited Singapore Branch's website at www.business.hsbc.com.sg for contact details. HSBC México, S.A., Institución de Banca Múltiple, Grupo Financiero HSBC is authorized and regulated by Secretaría de Hacienda y Crédito Público and Comisión Nacional Bancaria y de Valores (CNBV).

In Canada, this document has been distributed by HSBC Securities (Canada) Inc. (member IIROC), and/or its affiliates. The information contained herein is under no circumstances to be construed as investment advice in any province or territory of Canada and is not tailored to the needs of the recipient. No securities commission or similar regulatory authority in Canada has reviewed or in any way passed judgment upon these materials, the information contained herein or the merits of the securities described herein, and any representation to the contrary is an offense. In Brazil, this document has been distributed by Banco HSBC S.A. ("HSBC Brazil"), and/or its affiliates. As required by Instruction No. 598/18 of the Securities and Exchange Commission of Brazil (Comissão de Valores Mobiliários), potential conflicts of interest concerning (i) HSBC Brazil and/or its affiliates; and (ii) the analyst(s) responsible for authoring this report are stated on the chart above labelled "HSBC & Analyst Disclosures".

The document is intended to be distributed in its entirety. Unless governing law permits otherwise, you must contact a HSBC Group member in your home jurisdiction if you wish to use HSBC Group services in effecting a transaction in any investment mentioned in this document. HSBC Bank plc is registered in England No 14259, is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority and is a member of the London Stock Exchange. (070905)

If you are an HSBC Private Banking ("PB") customer with approval for receipt of relevant research publications by an applicable HSBC legal entity, you are eligible to receive this publication. To be eligible to receive such publications, you must have agreed to the applicable HSBC entity's terms and conditions ("KRC Terms") for access to the KRC, and the terms and conditions of any other internet banking service offered by that HSBC entity through which you will access research publications using the KRC. Distribution of this publication is the sole responsibility of the HSBC entity with whom you have agreed the KRC Terms.

If you do not meet the aforementioned eligibility requirements please disregard this publication and, if you are a customer of PB, please notify your Relationship Manager. Receipt of research publications is strictly subject to the KRC Terms, which can be found at https://research.privatebank.hsbc.com/ – we draw your attention also to the provisions contained in the Important Notes section therein.

[1167216]