Deutsche Bank
Research

The Future of Payments: Series 2

Part II. When digital currencies become mainstream

#PositiveImpact

Marion Laboure, Ph.D.
Research Analyst

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> The one thing that's missing, but that will soon be developed, is a reliable e-cash, a method whereby on the Internet you can transfer funds from A to B without A knowing B or B knowing A.
>
> – Professor Milton Friedman (1999), Nobel Prize winner

Summary on a page

A year ago, we stated that:

- Cryptocurrencies would become more mainstream. Both Facebook and PayPal will be adding cryptocurrency capability to their wallets early 2021. Facebook plans to launch Libra 2.0 in early 2021. With over 2.7 billion users (one-third of the world's population), Facebook now has the potential to compete with traditional online payment platforms and advance digital currencies into the mainstream. PayPal plans to further expand the roll out internationally and to the rest of its platform including Venmo in 1H21. This is a big development for crypto adoption, because PayPal is one of the biggest payment providers in the world. PayPal services are being used by over three hundred million customers worldwide. Twenty-eight million stores now accept PayPal as a payment method.
- Central bank digital currencies (CBDCs) will be widely discussed. The Bahamas launched the first nationwide CBDC last October, and both Sweden and China launched pilots in early 2020.

This year, we see that:

- The pandemic has hastened the decline of cash by four or five years. The world has shifted from asking whether digital currencies will succeed, to how and when they will become mainstream.
- Using cryptocurrencies for payments will accelerate. Energy consumption could hinder widespread use of cryptocurrencies and create negative press. Transaction speed remains low for most cryptocurrencies compared to card providers. The only exception is Libra, which is expected to run on FastPay. Libra's transaction speeds could surpass Visa by fourfold.
- Central bankers and policymakers will react by speeding up their existing research and launching pilots. China is likely to continue to dominate the race. In the long run, CBDCs will displace private cryptocurrencies and become the norm.

1. Big tech, fintech, and banks are leading cryptocurrencies into the mainstream

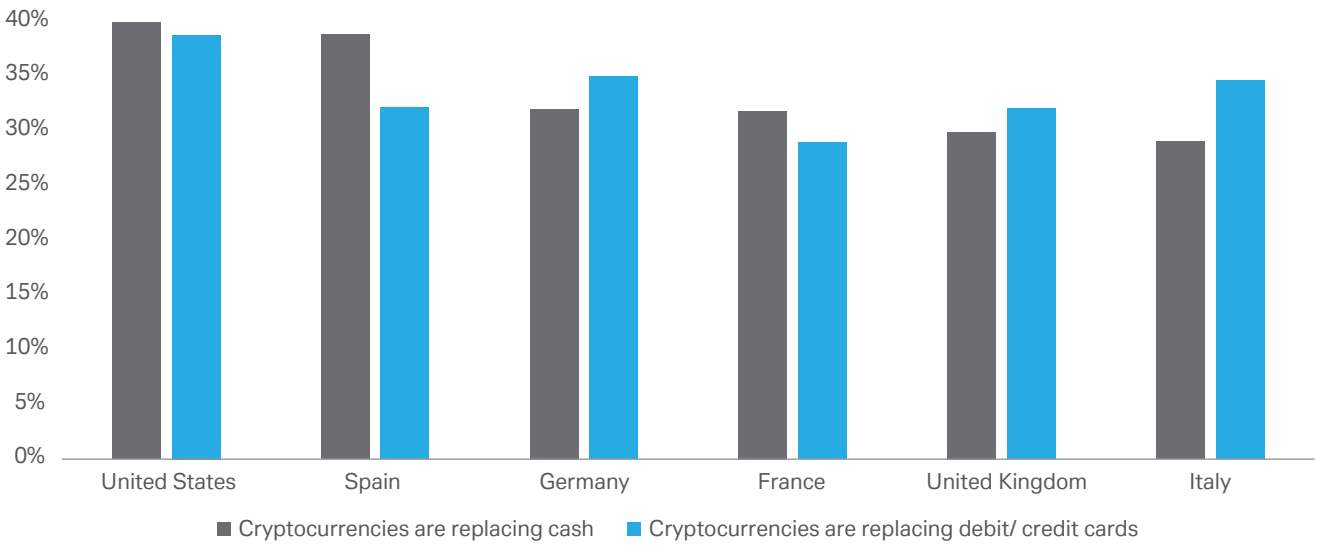
"[Libra] was a bit of a wakeup call that this is coming fast, and could come in a way that is quite, you know, widespread and systematically important fairly quickly if you use one of these big tech networks like Libra did."

- Jerome Powell (2020), Federal Reserve Chairman

1.1. Adoption rates of cryptocurrencies are on the rise

More than a third of millennials believe that cryptocurrencies will soon replace cash and credit/debit cards. Our exclusive survey of over 3,700 people in the United States, United Kingdom, Germany, France, Italy and Spain found that they envision a purely digital currency.

Millennials who think that cryptocurrencies are replacing cash and debit/credit cards

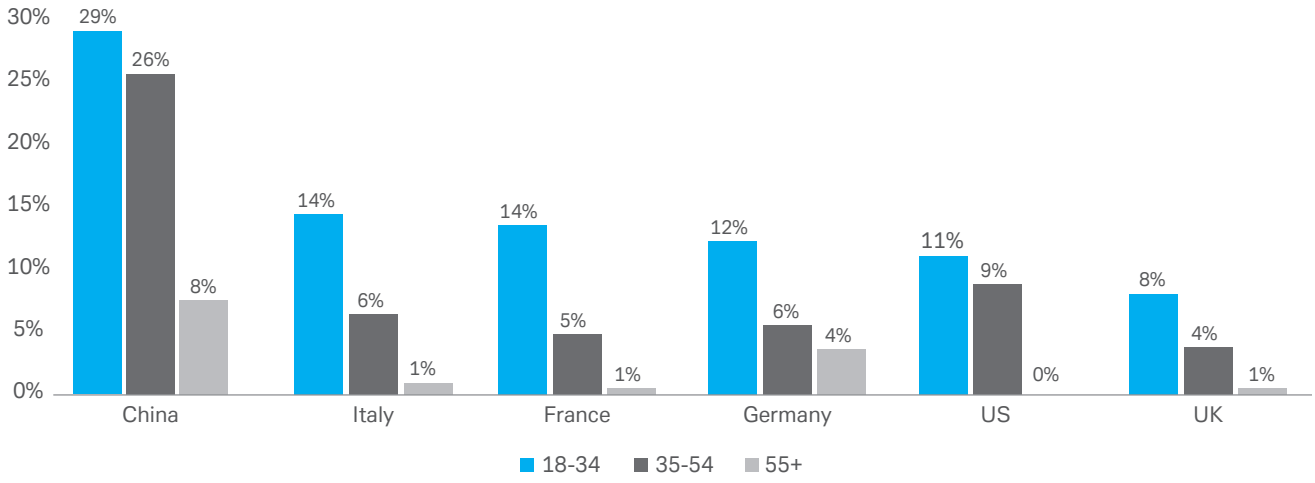


Source: Deutsche Bank dbDIG

Adoption rates of cryptocurrencies are influenced by generational views, as shown in the graph below. The older people we surveyed had fears about cryptocurrencies. They believed that cryptocurrencies create volatile financial bubbles (like the dotcom bust), and they see them as low-liquidity financial instruments. A third of those surveyed had no idea how cryptocurrencies work, and 40 percent had only a partial understanding.

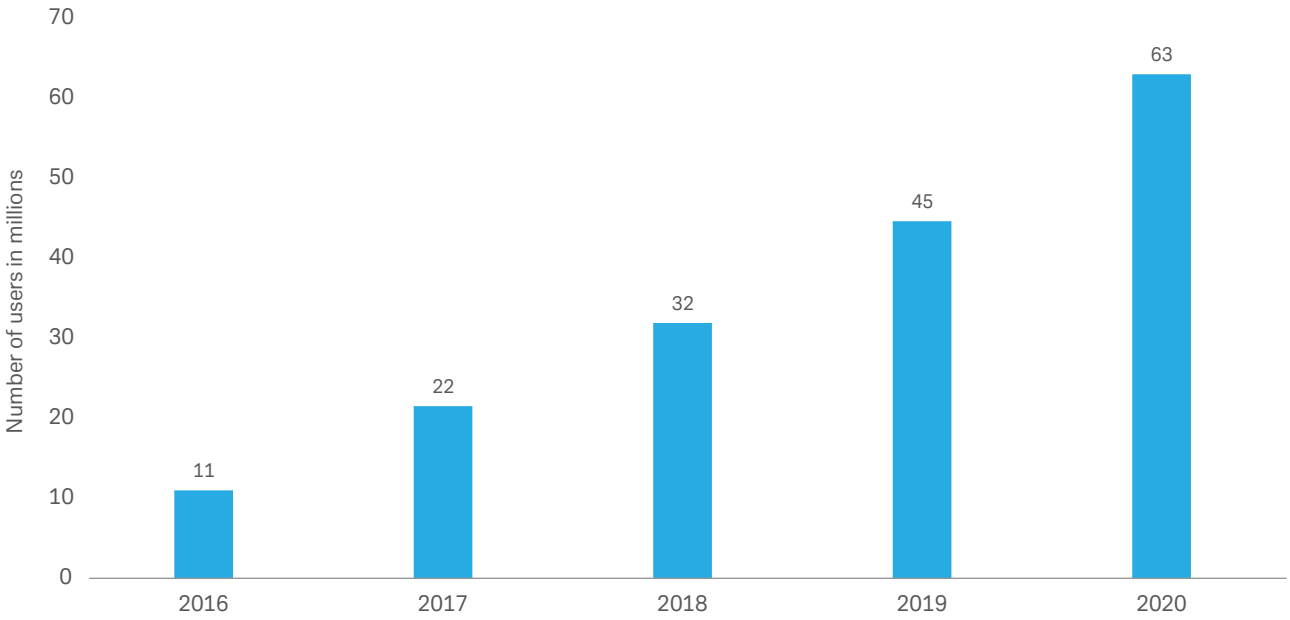
Younger people will likely adopt cryptocurrencies more rapidly, but they need to be educated about the dangers of non-CBDC cryptocurrencies.

Citizens who have bought or sold cryptocurrencies



Source: Deutsche Bank dbDIG

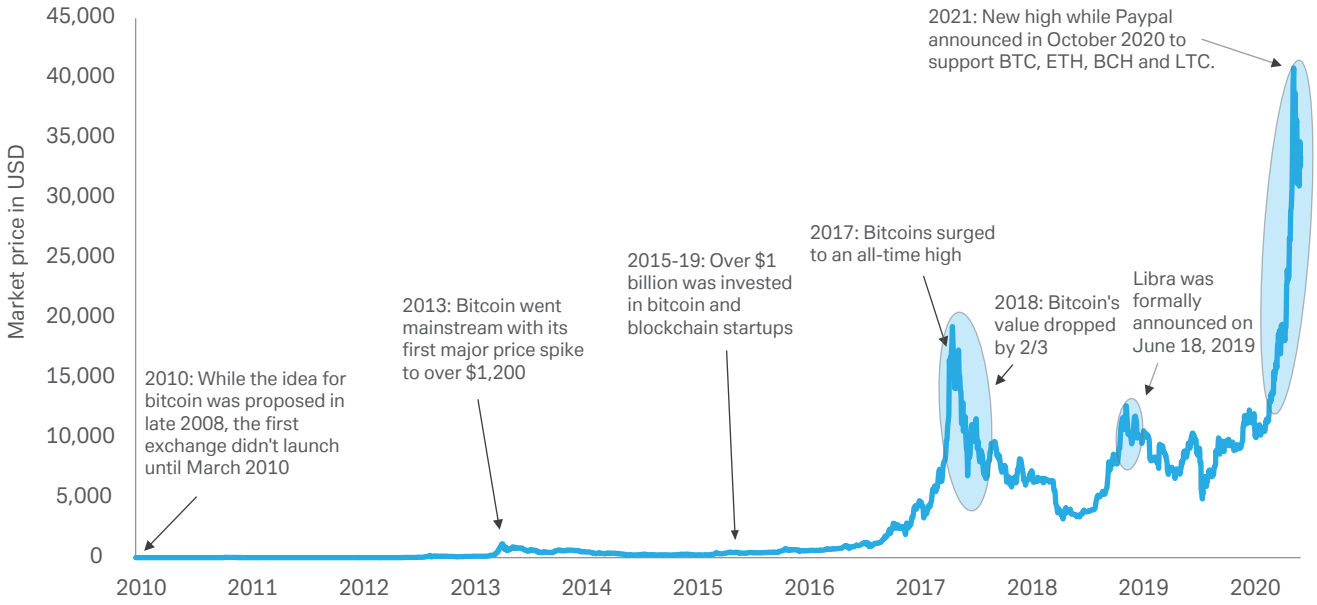
Number of Blockchain wallet users worldwide (in millions)



Source: Statista, Deutsche Bank

Since mid-March, the value of bitcoin has nearly tripled. BRD, bitcoin's digital wallet company, has been setting records for the number of downloads in recent weeks, adding nearly seven hundred thousand users in the US alone.

Bitcoin is too volatile to be a reliable store of value (market price in USD)



Source: Bloomberg Finance LP, Deutsche Bank

1.2 Facebook and PayPal bring cryptocurrencies into the mainstream

Facebook plans to launch Libra 2.0 in early 2021. Facebook's strategy has shifted toward more emphasis on cheapening payments, rather than competing with governments on creating a parallel means of payments. Libra has tweaked its plan by "offering single-currency stablecoins in addition to the multicurrency coin." Facebook, with over 2.7 billion users (one-third of the world's population), now has the potential to compete with traditional online payment platforms and advance digital currencies into the mainstream. The Libra currency is part of a broader ecosystem (including the digital wallet, calibra, which was recently rebranded as novi, and is scheduled to be launched in early 2021.

In late October, **PayPal officially announced that the company will add cryptocurrency capability to its wallets.** Positively, PayPal saw strong early adoption of cryptocurrencies with an early waiting list larger than anticipated in the US (now open to all in US), and the company plans to further expand the roll out internationally and to the rest of its platform including Venmo in 1H21. PayPal plans to allow users to complete transactions for goods and services leveraging their digital currency in early 2021. This is a big development for crypto adoption, because PayPal is one of the biggest payment providers in the world. PayPal services are being used by over three hundred million customers worldwide. Twenty-eight million stores now accept PayPal as a payment method.[1]

Visa and Mastercard are also pivoting towards cryptocurrency. Visa CEO, Alfred Kelly, stated his view in May 2020, that digital currency backed by fiat will be an emerging payment technology. His statement came as Visa filed a patent for a "digital fiat currency". This filing points to a CBDC use case. Visa also partnered with Circle in December to let card issuers integrate USDC payment capability.

Mastercard also jumped on the bandwagon in July, when the company announced a card deal with Wired, thereby expanding its crypto efforts. **Wired's multicurrency Mastercard debit card will allow users to buy, hold, exchange, and sell up to eighteen traditional currencies and cryptocurrencies, while also allowing for free international ATM withdrawals up to a certain amount.** Mastercard also launched a customizable CBDC testing platform in September.

1 PayPal: Crypto Important Addition to the Flywheel

Another major development came from the US Office of the Comptroller of the Currency (OCC) when it said in July 2020 that national banks can provide custody solutions for cryptocurrencies. Then, later in September, the OCC confirmed that banks can hold reserve deposits behind stablecoins. In December last year, the Swiss Exchange also said that it will launch an "Institutional Digital Asset Gateway" this year to get banks into crypto. Meanwhile, various banks like BBVA, CITI, DBS, Standard Chartered, PNC, and US Bank have shown willingness to get into the cryptocurrency-related business.

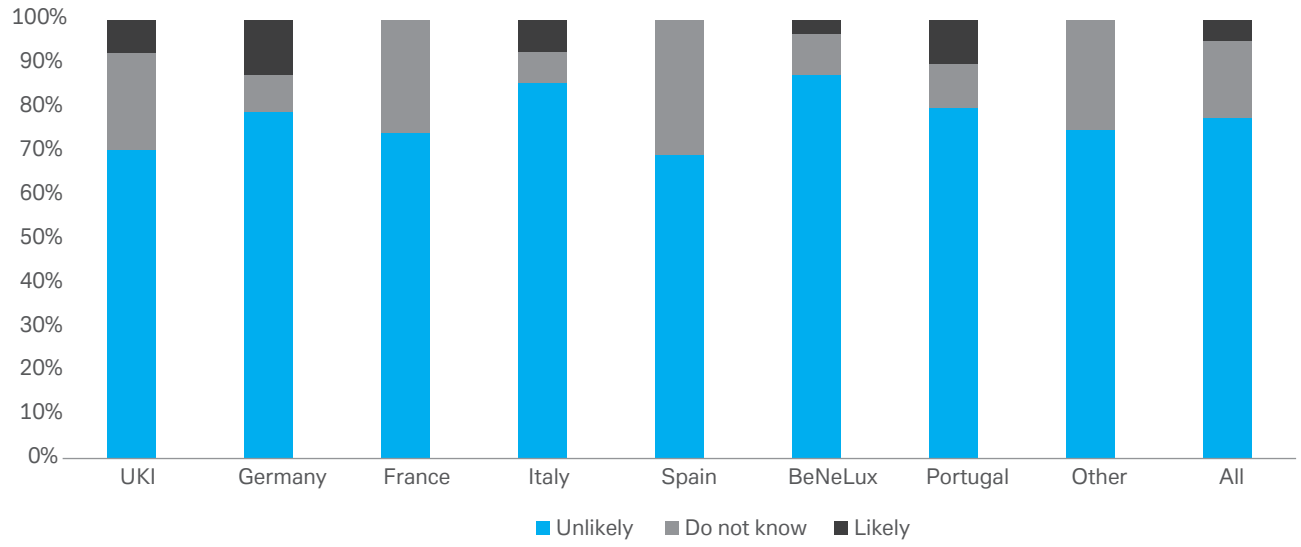
The 2020 year has been a banner year for financial services' digital asset developments

Source: The Block, Deutsche Bank

Globally, and especially in the US, China, and Russia, there are a number of venues through which people can purchase goods and services using bitcoin. According to Coinmap.org, there are nearly fifteen thousand of these venues worldwide. Major businesses (e.g., Microsoft, Expedia, Wikimedia, NewEgg, AT&T, Virgin Mobile, Shopify) have started to accept cryptocurrencies. An increasing number of travel companies (Expedia.com, cheapair.com, ScubaOtter and Alternativeairlines.com) and online shopping companies have recently entered the crypto market.[2] Some major retailers (Overstock, Home Depot, Namecheap, Starbucks, KFC Canada, and Whole Foods) have also started to accept cryptocurrencies as payment. Additionally, there are services from companies like Coincards and Bitrefill that accept user bitcoins and turn them into credit for use at a store of choice. Companies such as Purse.io allow consumers to spend bitcoin on their sites to buy from online retailers such as Amazon.

Corporations in other sectors are not yet giving adequate attention to anticipating these changes. Corporate treasurers are unlikely to adopt cryptocurrencies in the near future. In the next eighteen months, only 5 percent of corporate treasurers are likely to use and receive cryptocurrencies, and approximately 80 percent of them are unlikely to use cryptocurrencies.

In the next eighteen months, how likely is your company to use cryptocurrencies?



Source: dbDIG research

Part of the reason is the lack of crypto asset regulation. But things are moving and we expect 2021 to be a turning point year for crypto assets globally. Clearly, regulators have cryptocurrencies on their regulatory agenda as a key priority and we should reasonably expect a number of regulations to be adopted by the end of this year. For example, in the EU, following comprehensive market consultation in early 2020, the EU proposed a single regulation for all crypto-assets not falling under existing regulations (e.g. MiFIDII). The so-called Markets in Crypto-Assets Regulation (MiCAR) is expected to come into effect by the end of this year. In the US, the government has issued numerous regulatory guidance since early 2019 (e.g. Framework for Digital Assets). The new administration is expected to establish a collaborative and unified strategy to adjust the existing comprehensive regulatory framework and establish new regulations as needed to provide legal certainty.[3]

2 Oluwatobi Joel, Cryptocurrency Adoption, https://cointelegraph.com/news/cryptocurrency-adoption-how-businesses-are-adapting-to-the-blockchain-revolution

3 The UK has just started the consultation process and the government follows a staggered consultation approach with individual focus on the different categories and purposes of crypto-assets.
The Chinese government has high interest to establish and strengthen the digital Yuan. As such, we find targeted regulatory actions to support that. E.g. in 2017, in response to bitcoin peaks, the government increased already strict scrutiny over cryptocurrencies as the People's Bank of China (PBoC) prepared to launch its own digital currency. In October 2020, PBoC outlawed the issuance of private digital currencies.
In India, cryptocurrencies are no longer banned but regulatory activities are very much prohibitive. E.g. exchanges are legal, the government has made it very difficult for them to operate. We will see more activity throughout 2021.
In Japan, there are lots of regulatory activity for crypto-assets seen in 2020. Mainly focused on adaption of payment services act and financial services and exchange act to crypto-assets.

1.3. Transaction speed and energy consumption are major hurdles

The biggest technical hurdle is related to scalability; that is, the number of transactions that a means of payment can achieve. So far, the number of cryptocurrency transactions has been fairly limited with respect to cash and cards. Facebook's Libra is beginning to overcome the scalability barrier as it proceeds to run on FastPay, which is seven times faster than the Visa system.

Transaction speed

Medium	Transactions per second		
Cash	Unlimited	PayPal	193
China CBDC	300000	BitcoinCash	65
Facebook Libra	80000	Litecoin	56
Visa	65000	Dash	48
Mastercard	45000	Ethereum	20
Ripple	1700	Bitcoin	7

Source: Deutsche Bank, Visa, Various websites

Energy consumption could also hinder widespread use of cryptocurrencies. The electrical energy required for "mining" cryptocurrencies is astounding. In 2018, The New York Times reported that one bitcoin transaction required eighty thousand times more energy than one Visa credit card transaction, and that the "computer power needed to create each digital token consumes at least as much electricity as the average American household burns through in two years." Bitcoin uses a lot of energy because people who want a coin must compete for it by using mining operations that require huge amounts of computing power.

Libra is designed with an algorithm that issues cryptocurrency units in proportion to the size of a company's initial deposit into the system. It does not have a "mining" operation. Nevertheless, Libra is expected to consume as much energy as normal data centres, which is about 2 percent of total US energy usage, and to emit as much carbon dioxide as the airline industry.

Energy consumption: KWh per transaction

Medium	KWh per transaction
Ripple	0.00001133
Visa (USD)	0.00649
Mastercard (USD)	0.00649
Facebook Libra	0.00649
Cash (Euro)	0.08 KWh per printed banknote
Dash	1.517
Litecoin	18.522
BitcoinCash	18.957
Ethereum	20.294
Bitcoin	118

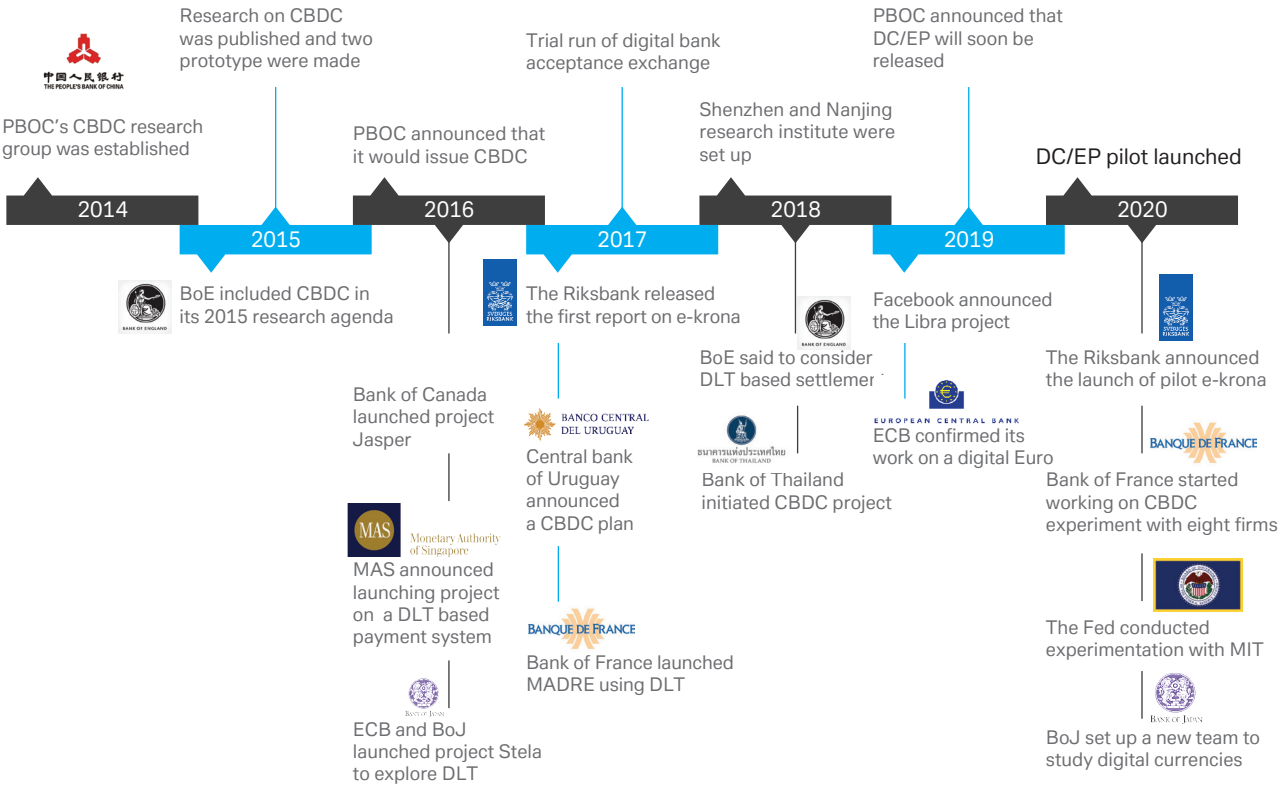
Source: Stanford University, University of Stockholm, Economist, Coindesk, Deutsche Bank. Note: For cash (Euro), energy consumption is KWh per printed banknote.

2. Central banks will fight for monetary control and pave the way for a new payments era

2.1. Central banks are forced to join the race

The pandemic has hastened the need for digital cash, thereby intensifying competition between companies and countries to develop digital currency solutions.

Timeline of CBDC research and experiments in various countries

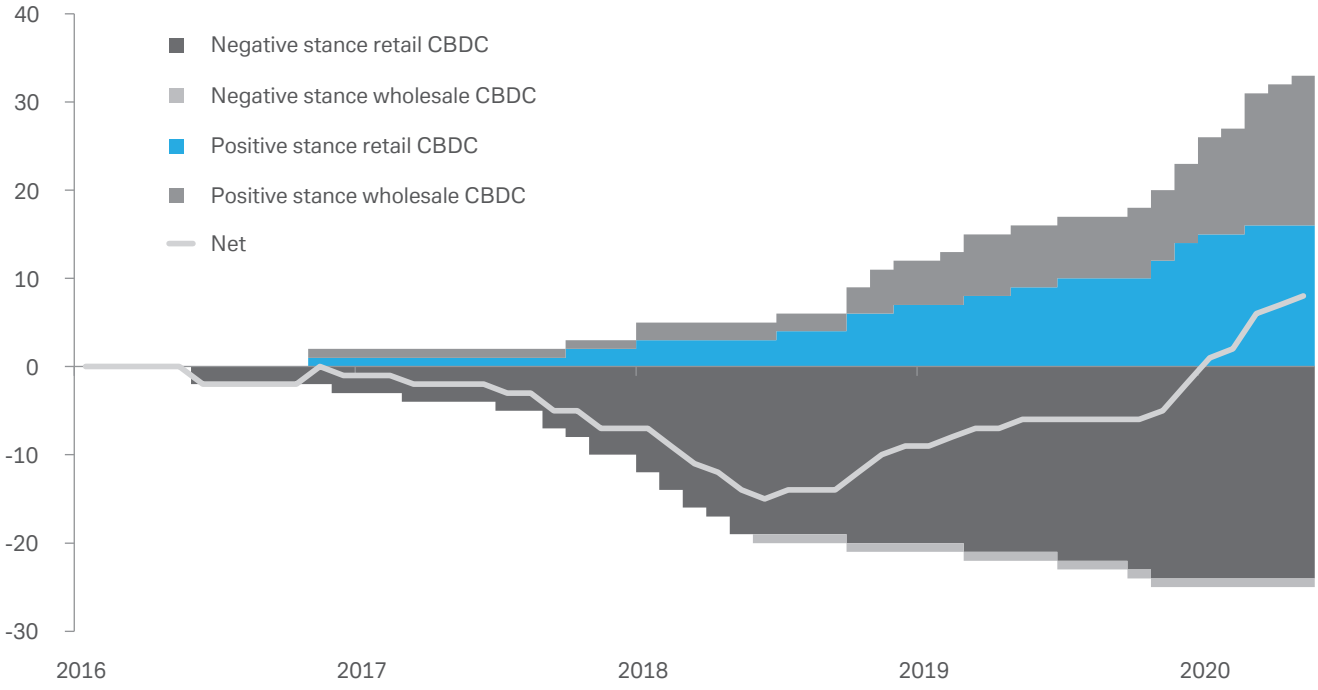


Sources: Deutsche Bank, various websites, Goldman Sachs.

Facebook's 2019 announcement about Libra spooked the world's major central banks into swift action. Jerome Powell, the US Federal Reserve chairman, in Congressional testimony less than a month after Libra's introduction, said this proposed currency raised "many serious concerns regarding privacy, money laundering, consumer protection, and financial stability". He stated the Fed's view that Libra cannot be allowed to go forward. Other central banks followed suit, with Christine Lagarde, the ECB president, warning that cryptocurrencies are "shaking the system". This constant friction between fintech innovation and regulatory efforts is likely to be an ongoing concern.

Interestingly, central banks rarely communicated about or worked on digital currencies before 2016. When they did communicate, the messaging was, on average, strongly negative. Beginning in 2020, central banks started to express more positive views, on average, about central bank digital currencies (CBDCs).

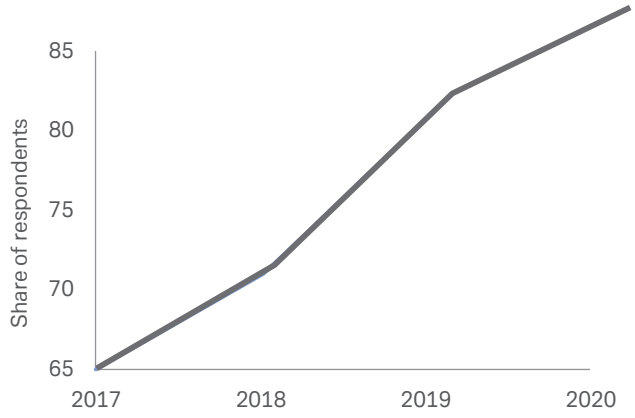
Central banks' speeches/work on digital currencies



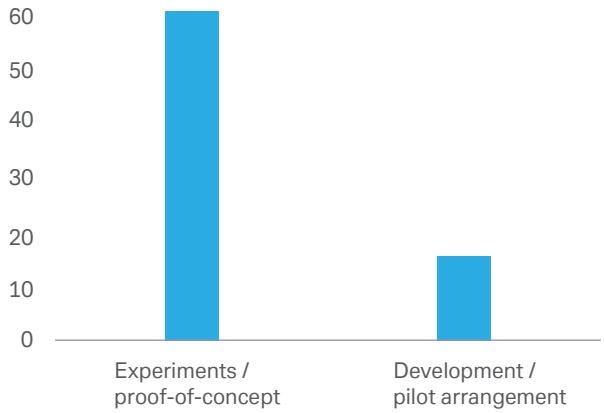
Source: R Auer, G Cornelli and J Frost, "The rise of central bank digital currencies: drivers, approaches and technologies", BIS Working Paper, no. 880, Deutsche Bank

Over the past three years, central banks and governments around the world have multiplied and sped up digital cash initiatives. A 2021 survey, by the Bank of International Settlements, revealed that 86 percent of central banks are developing a CBDC. The work goes far beyond research: 14 percent of central banks are already running pilot projects, and 60 percent are experimenting proof-of-concept. Looking ahead, central banks representing about a fifth of the world's population are likely to issue a general purpose CBDC in the next three years.

Engagement in CBDC work



Type of work in addition to research



Source: Bank of International Settlements, Deutsche Bank

2.2. Central Banks have started designing their digital currencies

The motivations to issue a general purpose CBDC are numerous: financial stability, monetary policy implementation, financial inclusion, payments efficiency (domestic and cross-border), and payment security. Among advanced economies, the primary motivation for developing a CBDC is to improve payment security. Emerging economies generally have a wider array of motivations, especially when a CBDC is designed to complement or substitute cash.

A CBDC could take two forms: (i) retail: a widely accessible and public electronic currency available for retail transactions; (ii) wholesale: a restricted electronic currency available only for large business transactions. The retail form of a CBDC would play the same role as any currency in circulation today, whereas the wholesale form would be like the reserves held by banks and other financial institutions.

Key design features of central bank money

	Existing central bank money		Central bank digital currencies		
	Cash	Reserves & settlement balances	General		Wholesale only token
			Token	Accounts	
24x7 availability	✓	✗	✓	(✓)	(✓)
Anonymity vis-a-vis central bank	✓	✗	(✓)	✗	(✓)
Peer-to-peer transfer	✓	✗	(✓)	✗	(✓)
Interest-bearing	✗	(✓)	(✓)	(✓)	(✓)
Limits or cops	✗	✗	(✓)	(✓)	(✓)

Source: Bank of International Settlements (2018). Note: X = existing or likely feature, (✓) = possible feature, ✓= not typical or possible feature

CBDCs could be interest-bearing. So, a negative interest rate policy could become more effective, directly affecting consumers. CBDCs offer 24/7 availability, and they are traceable, leaving a footprint of each transaction. The implications of CBDCs for corporations are immense because they will change consumer habits forever. These changes could include: moving consumers away from cash, cheques, and probably cards; impacting the payment infrastructure; and reducing transaction fees.

2.3. The leaders: Bahamas, Sweden, and China

The Bahamas launched the nationwide CBDC (the sand dollar) in October 2020, after a successful pilot in 2019, to improve financial inclusion, reduce service delivery costs, and to increase transactional efficiency.

This CBDC is based on digital ledger technology (DLT) at its foundation with a hybrid wireless network at the top to connect mobile devices. The hybrid wireless network provides connectivity in exacting ecosystems, a critical feature where hurricanes can cause power outages on the islands in the archipelago. The sand dollar will be up for use 24/7/365 in disconnected settings and will bear very low transaction fees. The sand dollar will not pay interest and cannot be held non-domestically. It can be used for all domestic wholesale and retail transactions.

With The Bahamas having 90 percent penetration for mobile devices and one of the highest per-capita incomes in the Americas, the adoption rate of the sand dollar is likely to be high and quick. Furthermore, the sand dollar is pegged to the USD; in effect, it can be seen as a pilot release of a digital US dollar by proxy. To support digital payments, an ecosystem of Authorized Financial Institutions (AFIs)—money transmitter businesses, payment service providers, and commercial banks—was created to provide services to retail customers.

In Sweden, research on a CBDC started in 2017, in part because cash in circulation had been declining since 2007. Cash in Sweden now represents only 1 percent of GDP. In February 2020,

Sweden revealed that it had started the first trial of its digital-krona project: the e-krona. The government could implement its digital currency throughout the country in 2021.

Sweden has been developing alternatives to cash since 2012. First, there is a new mobile payment system called Swish. The rapid transition toward a cashless society has roots in the country's laws, technology, and culture. First, while the nation's central bank laws stipulate that cash is legal tender and should be accepted by those receiving payment, the commercial law states that two parties (a merchant and a consumer) can enter an agreement that supersedes central bank guidelines. Second is the issue of infrastructure, specifically, strong broadband coverage, even in remote areas. Third, cultural factors have moved Sweden toward a cashless society, including a small, tech-savvy population, and a generally strong trust in institutions and new technologies.

China started researching CBDC projects in 2014 and piloting them in April 2020. This will be developed in part 3.

2.4. The followers: US, UK, and Eurozone

In October 2019, the ECB released a report on the possible issuance of a digital euro. No decision has been made yet, and the consultation phase ended in January.[4] The ECB will decide by about mid-2021 whether to launch a digital euro. For more details on the impact of CBDC on monetary policy, please see Focus Europe: Prosaic or profound? Central bank digital currencies and monetary policy.

According to the ECB report, "A digital euro would be a central bank liability offered in digital form for use by citizens and businesses . . . and would complement the current offering of cash and wholesale central bank deposits". In other words, a CBDC would:

- Be a third form of central bank money, existing next to cash and reserves
- Try to combine the advantages of world reserves, which are already digital but only available to banks, and cash, which is available to everyone, but physical
- Be digital and available to everyone

The digital euro would have cash-like functions. Offline payments would be possible, which is good because payments need to be available in rural areas and to people without internet access. Cash would remain legal tender.

The ECB has emphasised that a digital euro might be essential in several scenarios: if cash were to decline significantly; if other electronic payments methods were to become unavailable, owing to extreme events; or if foreign digital money were to largely displace existing means of payments.

The ECB has not chosen the currency's technology and architecture. The ECB is not excluding digital ledger technology (DLT), also known as blockchain. It is also not excluding programmability. These design dimensions need to be discussed in the coming months. So far, the ECB seems to envision a private-public partnership and to favour a model whereby access to the digital euro is intermediated by the private sector.

The ECB is considering (i) whether the digital currency could run on the existing Target Instant Payment Settlement (TIPS) system; or (ii) a hybrid structure which uses a combination of TIPS and distributed ledger technology (DLT). Initial results from the trial will be submitted to the Eurosystem High-Level Task Force on central bank digital currency by end-March. An investigation will likely begin in April if the central bank decides to pursue the CBDC and would last for about 18 months.

4 The ECB has received over 8,000 responses on the digital euro consultation highlighting that digital currencies are garnering intense discussion amongst market participants. Privacy ranked highest among the requested features of a potential digital euro (41% of replies), followed by security (17%) and pan-European reach (10%). The ECB said it will publish a comprehensive analysis of the public consultation in the spring, which will provide input for the ECB's Governing Council in determining whether, or not, to pursue the CBDC.

In the UK, the Bank of England (BoE) released a CBDC discussion paper in March 2020 but no decision has been made on whether to introduce a CBDC. The main arguments in favour of a CBDC are: the use of banknotes—the Bank's most accessible form of money—is declining; the use of privately-issued money continues to increase with technological changes driving innovation; it will help maintain monetary and financial stability. Regarding the latter argument, a CBDC can help maintain monetary and financial stability by:

- supporting a more resilient payments landscape
- allowing households and businesses to make fast, efficient, and reliable payments
- providing safer and more trustworthy payment services than new forms of privately-issued money-like instruments, such as stablecoins
- providing a building block for better cross-border payments in the future

The BoE does highlight that launching a CBDC will introduce challenges and risks that need to be carefully considered and managed. For example, if significant deposit balances move from banks to the CBDC, there could be a need to study how that impacts the balance sheets of the Bank of England and commercial banks. This move could affect the amount of credit provided by banks to the wider economy, and in turn, how the Bank of England implements monetary policy and supports financial stability.

As with the ECB, the BoE has also not made any decision on the CBDC technology and architecture. The BoE has stated that the central bank doesn't presume that it will use distributed ledger technology (DLT). There is no inherent reason why it could not be built using more conventional centralised technology. The CBDC may be able to provide "programmable money" through smart contracts. In terms of the CBDC's design, the BoE stated in its CBDC "platform" model that it would build a fast, highly secure, and resilient technology platform that would sit alongside a Real Time Gross Settlement (RTGS) service to provide the minimum necessary functionality for CBDC payments. This could serve as the platform that private sector "Payment Interface Providers" would use to provide customer-facing CBDC payment services.

In the US, the Federal Reserve Chairman, Jerome Powell, stated the need for further work and "extensive" public consultation with stakeholders before deciding to issue a CBDC. Fed Chair Powell has said that the central bank is not concerned with not being first in the CBDC race while adding that the US dollar's status as the world reserve currency already gave it a "first-mover advantage."

The Fed announced in August that it was expanding experimentation with technologies related to digital currencies. The Boston Fed is currently working with researchers at MIT to build a hypothetical digital currency oriented for central bank use. The Fed has indicated that any codebase developed through this effort will be offered as open-source software for experimentation. Meanwhile, the Fed has also constituted a team of application developers from the reserve banks in Cleveland, Dallas, and New York. They are working with a policy team at the Fed board in Washington to study "the implications of digital currencies on the payments ecosystem, monetary policy, financial stability, banking and finance, and consumer protection".

The Federal Reserve Board's Technology Lab has also expanded its experimentation to better understand and evaluate the risks and opportunities of technologies relevant to digital currency and related payment innovations.

The Bank of Japan aims to start early-phase experiments in 2021 on issuing a digital currency even though the central bank has no immediate plans to issue one. The BoJ's reluctance to rush toward a digital currency stems from the fact that cash remains the dominant method for transactions in Japan. Nonetheless, the BoJ has put its chief economist in charge of researching digital currencies as the pandemic possibly accelerates the use of cashless payments.

3. Looking to the future: China leads the way towards digital currency

"We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten. Don't let yourself be lulled into inaction."

Bill Gates, "The Road Ahead" (1996)

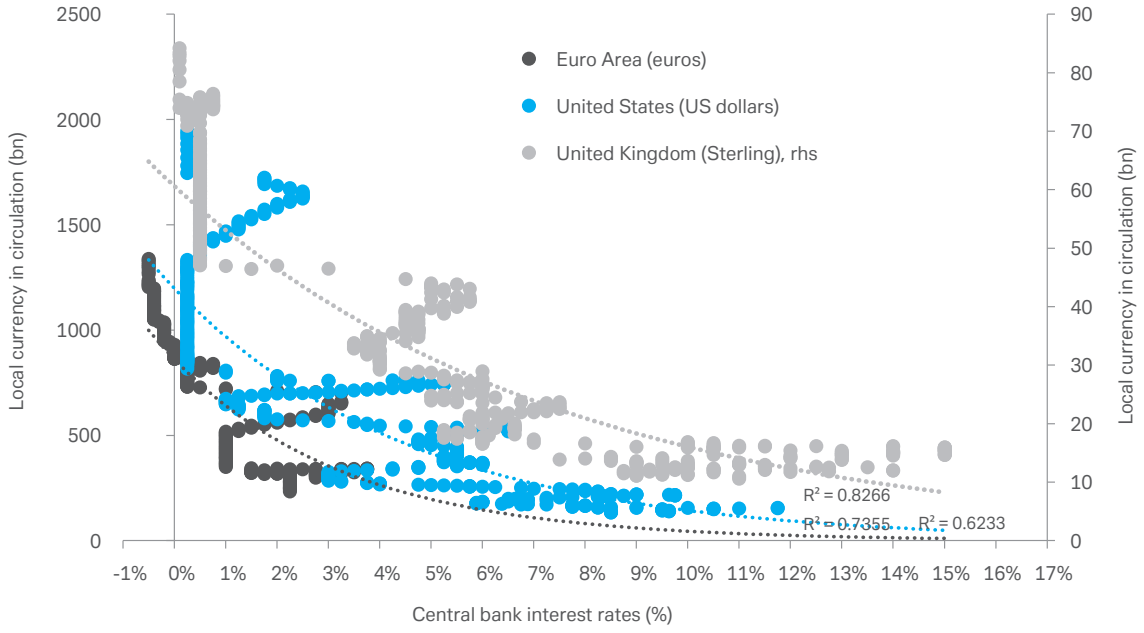
3.1 What must advanced economies overcome for populations to adopt digital currencies?

In our view, advanced economies must overcome two barriers for populations to adopt digital currencies: lower interest rates and cultural/privacy norms. Cash is regarded as a "store of value" and a "safe haven". In our survey, one-third of Americans and Europeans ranked cash as their favourite payment method, and more than half of the people in developed countries believed that cash would always be around. This statement pertained to survey participants regardless of their country, gender, or age.

Unsurprisingly, during the three months prior to May 2020, the increase of banknotes in circulation in the eurozone was EUR 75 billion. This is a new all-time high that exceeded the increase during the three months following the collapse of Lehman Brothers in late 2008.

Higher interest rates are necessary to bring the end of cash as a store of value. We have conducted an analysis of cash in circulation and interest rates within advanced economies. There is a strong negative association between the level of central bank interest rates and cash in circulation. Proving a causal relationship between cash in circulation and interest rates would require more work. However, we can say that low central bank interest rates certainly play a role in increasing cash in circulation.

Currency in circulation increases at lower interest rates



Sources: Deutsche Bank, Bloomberg Finance LP. Note: Interest rates: for the ECB it is the deposit rate, For the BoE it is the Bank Rate and for the Fed it is the Upper Bound of the Fed rate. Currency in circulation: for the Euro Area from M1 monetary aggregates of the ECB Economic Bulletin, for the US from M1 money aggregates of the Fed's Money Stock Measure release, for the UK from M1 monetary aggregates currency in circulation (ECB methodology).

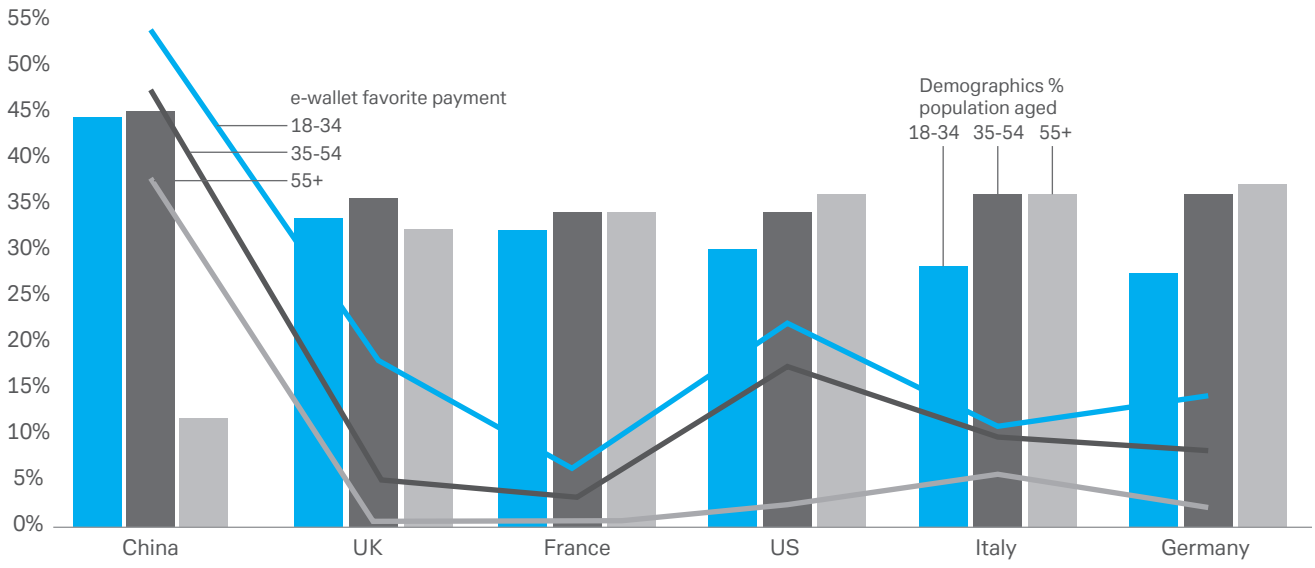
The US Federal Reserve, the ECB, the Bank of England (BoE), and the Bank of Japan (BoJ) have all lowered interest rates to near or below zero. Looking ahead, given that inflation is expected to remain low and growth depressed, central bank interest rates are remain near or below zero 2025 in most advanced economies. In a context of negative interest rates, consumers have little incentive to deposit or save money. So, moving cash from under the mattress into a bank account is unlikely to happen (at scale) in the near term.

Cultural factors related to convenience, usage, and privacy will also influence adoption rates. Banknotes and coins greatly reduce digital footprints because a cash transaction does not generate digital data. By contrast, digital currency transactions, albeit convenient, can be traced.

Perspectives on these two poles—privacy vs. convenience—vary from culture to culture. Our survey showed that citizens in advanced economies are more worried about privacy than people in emerging economies. Only a tenth of Chinese survey participants reported concerns about anonymity and traceability, well below the Americans (22%), British (21%), French (29%), Germans (42%), and Italians (19%).

The Chinese adoption rate of the government's CBDC—influenced by existing consumer habits and demographics—will take off at a faster pace than in most other countries. The Covid-19 pandemic has accelerated an ongoing shift among younger populations away from cash and towards digital payments, particularly in Asia and specifically in China. At the end of 2018, around 73 percent of internet users in China used online payment services (up from 18 percent in 2008). According to the World Bank, 85 percent of Chinese adults who bought something online also paid for it online. This is significantly higher than in other emerging economies where 53 percent of adults who made an internet purchase in the past 12 months paid for it by cash on delivery (COD).

Demographics and digital wallet favourite methods of payment – comparison between China and advanced economies

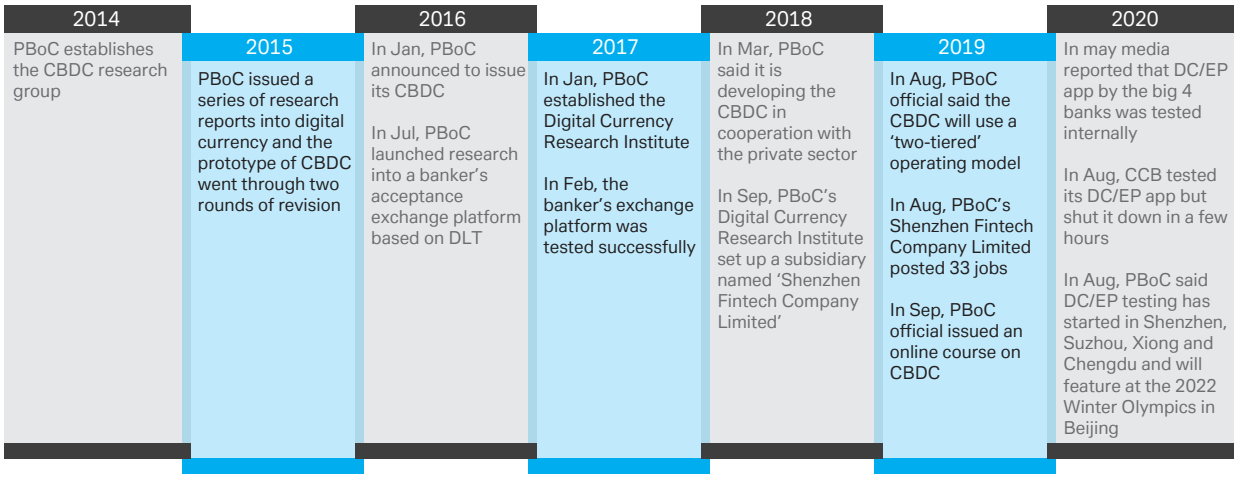


Source: Deutsche Bank db.DIG. Note: Demographics account for the percentage population represented in the 18-34, 35-54, and 55+ brackets. This excludes people under the age of 18. The representation of China is of those with internet access living in cities ranked as tier

3.2 Chinese CBDC: Growing up into reality

The People's Bank of China (PBoC) started to conduct research on a government-backed cryptocurrency as early as 2014. That project was called "DC/EP," (Digital Currency / Electronic Payment). Beyond replacing cash and improving financial inclusion, the long-term goal of the PBoC's digital currency was to improve the efficiency of transactions across the nation's financial system. The former president of Bank of China, Li Lihui, argued that a digital currency's efficiency, cost-effectiveness, and convenience would make it especially desirable during an epidemic.

The timeline of PBoC's DC/EP development



Deutsche Bank, various websites, Goldman Sachs.

In April, China began testing the e-RMB for payments in several major cities, including Shenzhen, Suzhou, Chengdu, and a new area south of Beijing called Xiong'an. The government is expected to expand pilot programmes at the venue for the 2022 Beijing Winter Olympics. According to state media, the e-RMB has been formally adopted into the monetary systems of the cities mentioned above, with some government employees and public servants receiving part of their salaries in the digital currency in May. In December, JD.com, one of China's e-commerce giants, announced that it will accept digital yuan as payment for some products on its online mall.

In early December, Hong Kong Monetary Authority (HKMA) Chief Executive, Eddie Yue, said that the PBoC and HKMA are preparing to test the digital yuan for cross-border payments. On the same date, Suzhou municipal government announced that it would give away 100,000 digital red packets, each containing RMB 200, to residents via a lottery. A similar trial was run in Shenzhen, where the city carried out a lottery in October to give away RMB 10 million-worth of digital yuan. Nearly two million people applied and fifty thousand of them won.

According to new patents registered by the PBoC, official speeches and press releases, China's CBDC is not built on a blockchain, which is a digital ledger often used by bitcoin and other private cryptocurrencies. In August 2018, the deputy director of the PBoC's payments department, Mu Changchun, suggested that a blockchain platform would not be able to deliver the throughput needed for retail. Therefore, it appears that the e-RMB will be centralized and issued first by the central bank to local commercial banks and then to users for circulation. So far, China's four major state-run banks—China Construction Bank, Bank of China, Industrial and Commercial Bank of China, and Agricultural Bank of China—have started large-scale internal testing of the digital RMB wallet.

The digital currency plan will be fully backed by the central government and pegged one-to-one to the Chinese renminbi. To initiate a payment, consumers and businesses would download a digital wallet on a mobile phone and transfer e-RMB from a commercial bank account to the digital

wallet, almost like going to an ATM. Users would be able to transfer the e-RMB seamlessly with their phones using NFC technology and the internet. Offline transactions—digital transactions that the central bank can't track in real time—are expected to be saved and processed once the digital wallet is back online. The reason for its offline feature is to make it appealing in areas with poor internet coverage or little access to commercial banks. China's state media reported that UnionPay is working with China's CBDC trials to test online and offline payments — using existing infrastructure. According to PBOC deputy governor, Yi Gang, more than RMB 2 billion had been spent using digital yuan in four million separate transactions in China. Residents used multiple payment methods, including bar code, facial recognition, and tap-to-go transactions.

Thus, the e-RMB would allow regulatory authorities to see and trace every transaction (unlike cash transactions). "The e-RMB will spot certain behavioural patterns using big data and identify the users" so the technology can "help the government crackdown on money laundering, tax evasion, and financing terrorist groups". The e-RMB will adopt the principle of "controllable anonymity", which means that when trading with the digital currency, both parties can be anonymous to protect the public's privacy, but when it comes to combating corruption, money laundering, tax evasion, and terrorist financing, the state banks can still track the trading information.

Conclusion: could central bank digital currencies disintermediate banks?

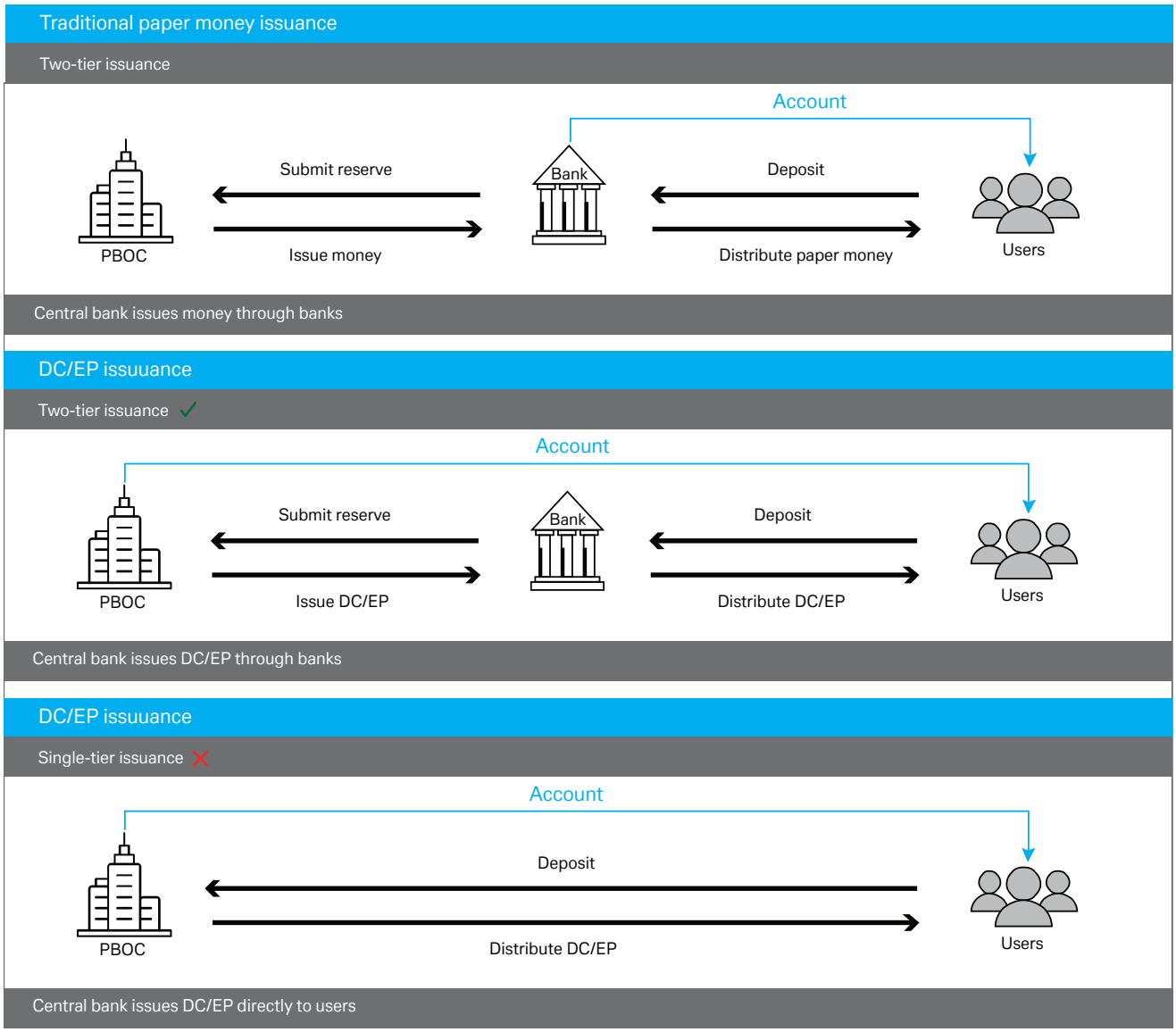
With bank accounts paying low interest rates, a CBDC has a high potential to disintermediate the banking system. People might choose to hold their money directly at the central bank. Obviously, this would disrupt legacy bank franchises and impact financial stability. Credit card volumes, interchange fees, payment transaction fees, and deposit interest margins could be seriously affected. This would shake the current two-tier system and create additional responsibilities for central banks, such as "know your customer" (KYC) issues and disputes; monitoring transaction levels; preventing money laundering and terrorism financing (AMLCFT); and tax compliance.

Several central banks, including the BoE, have warned that if significant deposit balances move from banks to CBDCs, the balance sheets of both central and commercial banks could be impacted. A major shift might also have an impact on the amount of credit provided by banks to the wider economy, and in turn, affect how a central bank implements monetary policy and supports financial stability.

Some degree of disintermediation is an inevitable consequence of a successful CBDC. Thus, commercial banks need to consider how to react to a prospective loss of deposit funding. Two possible solutions would be to pay a higher interest rate on deposits to limit further outflows to a CBDC, or to replace lost deposit funding with alternatives, such as longer-term deposits or wholesale funding. Overall, both options would raise cost of funding. Assuming banks seek to maintain profit margins, this could lead banks to increase the cost of the credit they provide to the economy, resulting then in a lower volume of lending by banks, all else being equal.

Currently, the digital currency model favoured by most central banks seems to be two-tier issuance. As with a traditional currency, transactions would be decentralised and supply would be centralised.

Key design features of central bank money



Source: Deutsche Bank

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