

Central Bank Digital Currencies and the Future of Money

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This report is Part I of a series of publications on the future of money



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Central Bank Digital Currencies (CBDCs) are potentially one of the most significant innovations in the evolution of money. In this report^{*}, we explore different aspects of CBDCs and their impact on the future of money.

We examine the future mix of CBDCs, stablecoins and crypto currencies and how they will co-exist alongside other traditional digital and physical currencies. Rather than being a zero-sum game, the presence of CBDCs will grow the overall footprint of digital currencies in the economy.

Furthermore, even though CBDCs are currently the focus of macro-economic debate, we anticipate that the ripple effects will soon trickle to businesses and customers. Specifically, in this report, we explore the potential impact of CBDCs on financial institutions, such as banks.

There is no doubt that Central Bank Digital Currencies (CBDCs) are in the spotlight. From mainstream media to policy makers and from regulators to bankers, there is growing discussion about this new payment technology.

In fact, according to the Bank for International Settlements, 85% of the central banks in the world are currently either studying or piloting CBDCs.

So, what's behind the big buzz and what are the key points one can take away?

While CBDCs are a complex topic and their narrative is still developing, in this report we take a broad view of their key features and the main scenarios that are likely to emerge in the coming years.



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CBDCs and tokenised money

Throughout history money has evolved. Beginning with the use of everyday objects, to precious metals, to the gold standard and finally, to fiat in 1971, money has changed in line with broader technological and social shifts.

The development of computer technology in the second part of the twentieth century allowed money to be represented digitally. By 1990, in the United States, all money transferred between its central bank and commercial banks was in electronic form. By the 2000s most money existed as digital currency in bank databases.

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While digital money has been around for a few decades, many argue that we are now at the verge of digital money 2.0. Not the account-based electronic money that's been around for the past several decades, but a new type of **token-based digital money**. Tokenisation, often via blockchain, is the basis of cryptocurrencies, stablecoins, and many proposed central bank digital currencies (CBDCs).

The new wave of tokenised money started with the introduction of Bitcoin in 2008 as the first widely used, decentralised, peer-to-peer, cryptocurrency based on distributed ledger technology called blockchain.

Another inflection point came with the announcement of Libra (now renamed Diem) in 2019 by Facebook. Conceived as a private stablecoin - a privately issued crypto currency pegged to a stable asset (e.g. fiat money, physical gold etc) - Libra/Diem led to the development of a number of other stablecoins.

It is against this backdrop that Central Banks around the world have ramped up interest in CBDCs.

Conceived as a digital representation of fiat currency, CBDCs are a liability of the central bank in the same way as physical currency. This is a major differentiator between CBDCs and other tokenised money forms such as cryptocurrencies and stablecoins.

Types of CBDCs

Wholesale vs retail

One way of categorising CBDCs is with respect to their implementation model. CBDCs can be either wholesale or retail. In the wholesale model, access to central bank digital currencies is restricted to a limited group of commercial banks and clearing institutions; conversely, in the retail model, access is widened to corporates and businesses or generally across the economy to all consumers.



Wholesale

Retail

Currently, wholesale efforts are more prevalent in advanced economies that have more developed interbank systems and capital markets. In contrast, retail CBDC projects are more common in emerging economies with financial inclusion expected as an outcome.

Account based vs token based

Another way of categorising CBDCs is to consider their underlying format. Specifically, CBDCs can either be account based or token based.

In an account based format, ownership of the CBDC is linked to an identity whereby a transaction is an update of payer and payee balance. This type of format resembles the systems we use today for sending digital payments.

In a token based format, ownership of the CBDC is linked to a proof. Using cryptography, it is possible to verify digital signatures to execute and verify transfer. Thus, a transaction is a change of ownership of a specific unit of account or token. In this sense, the tokenised format resembles ownership of cash.

Importantly, tokenised CBDCs - along with other forms of tokenised money such as cryptocurrencies and stablecoins - can be programmed. Such CBDCs represent 'programmable money' whereby different logics are wired within the definition of money itself and where rules in payments between multiple peers can be automated.



In an account-based CBDC (left-hand side), ownership is tied to an identity, and transactions are authorised via identification. In a CBDC based on digital tokens (right-hand side), claims are honoured based solely on demonstrated knowledge, such as a digital signature.

Source: Bank of International Settlements

Direct, indirect and hybrid models

Yet another way of categorizing CBDCs is according to their distribution models.

Direct Model: Under this model, all parties involved in the transaction will hold an account at the central bank. Payments will simply be a transfer from one account to the other and all claims will be backed by the central bank. The central bank will issue the currency and manage a permission system to clear transactions. In addition, Know Your Customer (KYC) and anti-money laundering (AML) compliance requirements will be met by the central bank.



Indirect Model: In the indirect model, the central bank will pass the digital currency token to the commercial bank or a non-bank financial institution (e.g. fintech), which will then distribute the currency and also handle KYC and AML requirements. The claim for the currency will be on the commercial bank or non-bank financial institution and not the central bank. This type of CBDC is also referred to as 'synthetic CBDC' by the IMF.

The Hybrid Model: A big proportion of central banks are working on a hybrid model, whereby the central bank distributes CBDC to a regulated intermediary such as a commercial bank or fintech, which handles the transaction and the KYC and AML requirements. However, importantly, the claim remains on the central bank.

What are some of the perceived benefits?

The buzz around CBDCs is growing as they are meant to have many benefits. For example, the cost of managing and transferring cash is high for governments and this technology can reduce expenditure.

Moreover, safe money accounts at the central banks could boost financial inclusion for all segments of society, allowing any legal resident or citizen to be provided with a free or low-cost basic bank account.

Lastly, CBDCs make it easy for a central bank to keep track of the precise location of every unit of the currency and this makes it easier to tackle tax evasion and financial crime.

So, what is the downside?

As is the case with most technologies, there are also some potential risks associated with CBDCs. For example, if citizens pull too much money out of banks at once and purchase CBDCs, it could trigger a run on banks.

Centralising digital currencies through the government could also increase data privacy concerns.

Finally, some current legal frameworks are not comprehensive enough or modernised enough to deal with the new forms of money. In the absence of robust legal systems, the issuance of CBDC poses legal, financial and reputational risks for central banks.



- Lower costs
- Financial inclusion
- Tracking Financial Crimes



- Run on banks
- Data privacy concerns
- Risks for Central Banks

What is the current state of play?

To date, no country has officially launched a *large-scale* CBDC regime. Many central banks, however, have launched pilot programs and research projects aimed at determining a CBDC's viability and usability.

In 2016, the Bank of England was amongst the forerunners to start discussions for a CBDC followed by the Central Bank of Sweden. Soon after People's Bank of China, Bank of Canada, and central banks of Uruguay, Thailand, Venezuela, Sweden, and Singapore, among others, began exploring the idea of introducing a central bank-issued digital currency.

In fact, it is anticipated that China will transition to mass adoption of a CBDC by the Beijing Winter Olympics in 2022. By one estimate, China's CBDC could account for 15% of all Chinese electronic payments in ten years.

The Middle East region is no exception to this growing global trend. The Saudi-UAE "Aber Project" towards the end of 2020 saw the two countries explore the possibilities of a single, dual-issued, central bank digital currency as an instrument of domestic and cross border settlement.

More recently, in Feb 2021 the Central Bank of the UAE along with the People's Bank of China joined a cross-border payments pilot project.



The road ahead

Clearly the discussion and debate around CBDCs will intensify in the coming times. As with any new technological innovation, both the pros and cons will have to be well considered; intended and unintended consequences will also need to be examined.

However, it is apparent that the potential benefits of CBDCs are now firmly on the radar of most policy makers. While the story of CBDCs is still unfolding, certain key features are already notable. For instance:

- It is highly probable that the future of money will be a mix of centralised, decentralised, account based and token based with CBDCs, stablecoins and crypto currencies co-existing alongside traditional digital and physical currencies.
- Most countries are currently looking at wholesale CBDCs as a first step, since retail CBDCs may be associated with greater risk. However, with ongoing research and piloting one can anticipate that safe and efficient retail CBDCs will also be rolled out in due course.
- Irrespective of the model used wholesale or retail, account based or token based CBDCs will provide a big boost to digital currencies in the coming years. Tokenised CBDCs, in particular, will lend themselves to several use cases. For instance, it will make it possible to explore automated taxation and conditional welfare payments.
- CBDCs may also see some countries leapfrog others, similar to what we are seeing in the digital payments space in the emerging markets.

- In many cases, the rollout of CBDCs will involve public private partnerships. For instance, under one framework of retail CBDC, the central bank may issue the currency to a regulated intermediary who then distributes it to the public. There are numerous models currently being studied which involve the private sector to varying degrees. However, it is clear that technology companies, fintechs, third party providers and banks will all have a role to play within the CBDC architecture.
- As CBDCs gain mainstream interest, there is also scope for increased consultation between the private sector and central banks. This may involve regulatory sandboxes and innovation hubs set up by central banks to enable tech companies, fintech and other financial institutions to experiment with various options.
- Concerns over data privacy will have to be well balanced with the potential benefits of CBDCs the nexus between law, technology and finance will become more significant in public policy and practical implementation.

Implications for Financial Institutions

At the moment, CBDCs are the focus of macro-economic debate but we anticipate that in some time the ripple effects will trickle down to businesses and consumers. In the next section of our report, we look at some of the implications of CBDCs for financial institutions such as banks. How can financial institutions start preparing for CBDCs?

Clearly, CBDCs have the potential to change the way individuals and businesses store money and facilitate transaction processing. This may also also alter the way customers interact with financial institutions. Below, we highlight considerations for the following traditional banking services:



Impact on traditional

banking services

Source: PwC

1. Deposit and Loans: If a retail CBDC with a digital wallet is introduced which is capable of being hosted with a non-bank financial institution, banking deposit accounts will face new competition. The potential lower deposit balances pose an asset liability management risk should reserves fall below requirements needed for lending activities. In addition, some users may choose to store CBDCs in digital wallets offered by competitors if they could save on fees or if it is more convenient to do so. In this case, banks may face pressure to consider offering higher interest rates on deposits and adjusting their fees when competing for CBDC deposits.

2. Payments: The ability to conduct payments instantly and electronically via digital wallets could pose a threat to financial institutions' ability to collect fees from wire transfers, check issuances, and other payment services. If the CBDC is designed to allow for central bank-issued digital wallets, financial institutions may face competition from potentially lower fees. In situations where users store their CBDC on third party digital wallets, traditional financial institutions will likely face competition from technology companies.

3. ATMs & Branches: CBDCs will heavily influence the already-changing banking infrastructure, reducing the need for ATMs and branches (and therefore commercial real estate) that will no longer serve as essential sources of access to paper money. Branch and ATM usage have gradually decreased over the past several years, with last year seeing drops in usage of approximately 50% and 60%, respectively. The potential introduction of CBDCs would likely further accelerate the impact of this transition, resulting in cost savings in real estate and marketing but also reducing the market presence in metropolitan areas with dense foot traffic.

How can financial institutions prepare themselves for a world of CBDCs? A starting point may be to recognise the possibility of a future where: (1) a significant amount of global economic activity is conducted with CBDCs, (2) cash usage has dramatically declined, and (3) business models have changed drastically.

Design a digital asset strategy: Some financial institutions have begun adapting to innovation in the digital asset space by, for example, offering stablecoins and tokens; providing institutional custody services; introducing digital asset investment products; and building out digital asset payment rails. Firms that have taken these initial steps may find themselves at a competitive advantage.



Financial institutions can begin by first understanding how their core capabilities intersect with the necessary capabilities needed to support CBDCs, for example, by examining whether their programs are equipped to handle the expansion of traditional custody services to include digital assets.

This includes considering whether existing programs can be leveraged to support physical CBDC custody (i.e., safeguarding digital assets stored on physical devices), adopting cybersecurity practices to protect against hacking, and using cryptography to support the use of public and private "keys" (i.e., encrypted strings of information used to transfer and withdraw digital assets).

Further, when building capabilities for digital wallets and related transaction processing services, financial institutions should consider how they can take advantage of their existing infrastructure for third-party payment platforms and deposit accounts.

Because CBDCs will need to interact with the existing financial services ecosystem, financial institutions should also consider how their existing systems may potentially need to be updated, integrated or retired based on CBDC design and implementation decisions.

Develop the appropriate skillset: To avoid being caught off guard, financial institutions will need qualified and knowledgeable staff who will be ready to adapt and begin implementation processes quickly regardless of the final design decisions. Firms should consider the following questions:



How will you know your CBDC customers? While final CBDC design decisions have yet to be taken around the world, a highly anticipated feature is interoperability. This component of CBDCs offers convenience for consumers traveling across borders and institutions transacting internationally, but digital asset AML and know your customer (KYC) standards and regulatory expectations are evolving. An institution supporting CBDCs will need to reflect this in its financial crime risk assessment and revise its program accordingly. As jurisdictions implement new AML and KYC requirements for digital assets, institutions will need to ensure their risk-based approach will meet these new compliance obligations.

Source: PwC



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