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Agenda

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- Background
- Blockchain (distributed ledger) Technology
- CBDCs in Development - Sweden, Canada, and China
- U.S. CBDC – Retail or Wholesale
- Privacy Concerns
- Authority of the Federal Reserve to issue a digital currency and if a digital dollar will be *real* currency or legal tender
- Conclusion

The Wall Street Journal

Why Central Banks Want to Create Their Own Digital Currencies Like Bitcoin

The pandemic is accelerating a shift away from the use of physical cash in most developed economies, with alternative payment methods or private cryptocurrencies potentially taking its place.

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Background

- "You can count on the Americans to do the right thing after exhausting the alternatives."
- As China, the fastest growing economy in the world, actively works to issue its central bank digital currency ("CBDC"), the United States has not launched a pilot digital currency or issued a formal position paper on the creation of a digital currency.
- It appears the slow and steady approach is being set by Jerome Powell, the Chairman of the Federal Reserve, who has noted that with respect to the creation of a U.S. CBDC, "[i]t is far more important to get it right than it is to do it *fast*".
- The creation of a digital currency is being discussed by U.S. lawmakers, the Secretary of the Treasury, and Federal Reserve staff. Senator Elizabeth Warren noted during a recent hearing:

  Central bank digital currency ... has great promise. Legitimate digital public money could help drive out bogus digital private money, while improving financial inclusion, efficiency, and the safety of our financial system—if that digital public money is well-designed and efficiently executed ...

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Background

- One apparent supporter of blockchain technology is former Chairman of the Federal Reserve System and current Treasury Secretary Janet Yellen, who has noted:

  It makes sense for central banks to be looking at [central bank digital currencies] ... We do have a problem with financial inclusion. Too many Americans really don't have access to easy payment systems and to banking accounts, and I think this is something that a digital dollar – a central bank digital currency – could help with. I think it could result in faster, safer and cheaper payments.

- The United States appears to be *exploring* the creation of a digital currency while other countries and the International Monetary Fund ("IMF") have embraced the fact that "CBDC[s] could be the next milestone in the evolution of money".

- Some experts believe the United States is unaware that it is in a race with China and other nations to develop a CBDC and that the United States could be "*at least a decade away* from using a [CBDC] backed by the [Federal Reserve]".

- Niall Ferguson has noted the introduction of the Chinese CBDC could accelerate the "demand for a monetary revolution ... [that] will be driven by digital technologies that enable not only new forms of government-issued fiat currencies ... but also private currencies generated in innovative ways, such as through distributed ledgers".

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Background

- There are many theories about the origin of money because it serves so many functions but one of its chief use cases is as a measure of value to facilitate exchanges/transactions.
- In North America, pre-colonial Americans faced money shortages because England prohibited settlers from minting their own coins. As a result, early American settlers adopted the traditional trading methods of Native Americans, who had been using certain goods as mediums of exchange.
- In 1792, the passage of the Coinage Act established the United States' first national mint, which led to the nation's first circulating coins delivered by the mint in March 1793.
- Over the next 220 years, the concepts of currency and legal tender have evolved in the United States from coins backed by silver and gold to digital currencies built on distributed ledger technology.
- New payment methods have developed over the centuries, including coins, banknotes, checks, and credit and debit cards.
- Today, global central banks, academia, and the legal profession are actively discussing the development of CBDCs.

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Blockchain

- A blockchain is a database structure that can only be updated by appending a new set (or block) of valid transactions to the log of a previous transaction.
- In its most basic form, the blockchain records ownership of bitcoin and transactions involving the crypto currency across a wide network of computers, as opposed to a centralized ledger.
- Transactions are signed off by the parties involved using the software, checked by the network or the "crowd", then added to the blockchain – a long string of code that records all activity.
- Encryption in the software ensures these 'blocks' cannot be tampered with or altered.
- And the decentralized nature means the 'crowd' police the whole system.
- The software cuts out the need for a "trusted middleman" to sit in between parties in a transaction, such as a bank or clearinghouse.
- This makes transactions quicker, cheaper, and easier when compared to the current systems banks use.
- Many firms in the financial services industry believe blockchain technology can be adapted for use in traditional financial services transactions in a way that "has the potential to redefine transactions and the back office of a multitude of different industries."

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Blockchain

Permissionless Networks

- On a public (permissionless) blockchain, access to the network is unrestricted.
- Despite public misconceptions of the technology, public blockchains are not anonymous.
- Users in a permissionless blockchain network use a pseudonym.
- On a public blockchain network, users can validate transactions.
- Validation is the process that ensures that all nodes are synchronised and that there is agreement on the legitimacy of transaction blocks.
- Consensus must be reached after each new block is added, and only after that can the block be considered immutable.

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Blockchain

Permissioned Networks

- Permissioned blockchain networks are based on consensus mechanisms.
- Only approved participants can update a permissioned blockchain.
- A centralised authority must determine which consensus to use, how many nodes should participate in the network, and who authorises new nodes.
- In addition, someone must (determine and) validate cybersecurity requirements, and decide when to upgrade and validate the code.

Wallets and Keys

- Digital assets are stored by associating them with addresses called “wallets”, which can be stored on web servers, local hardware such as personal computers, jump drives and mobile devices, or on paper printouts.
- A digital asset wallet takes the form of a cryptographic public key, which is a string of numbers and letters.
- Each public key has a matching “private key”, known only to the user.
- Control of the private key is what assures one control of the digital assets at any address, so collections of private keys must be protected by passwords or other means of securing them.

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Central Bank Digital Currencies

- CBDC is central bank-issued digital money denominated in the national unit of account that represents a liability of the central bank.
- If the CBDC is intended to be a digital equivalent of cash for use by end users (households and businesses), it is referred to as a “general purpose” or “retail” CBDC.
- As such, it offers a new option to the public for holding money. CBDC is different from cash, as it comes in a digital form unlike physical coins and banknotes.
- CBDC is also different from existing forms of cashless payment instruments for consumers such as credit transfers, direct debits, card payments and e-money, as it represents a direct claim on a central bank, rather than a liability of a private financial institution.

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CBDC Models

Retail CBDC

- A retail CBDC would be a digital liability of a central bank that can be used by the public.
- A retail CBDC instrument would not be commercial bank money, credit cards, or mobile payment application balances because it would be a liability of the central bank.
- A retail CBDC would be different from traditional currency because it would only exist in digital form.

Wholesale CBDC

- Wholesale CBDC is a digital liability of a central bank that is limited to certain financial institutions and is not available to the general public.
- Wholesale CBDC is designed for use by financial institutions and is similar to traditional central bank reserve and settlement accounts.

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Central Bank Digital Currencies

- At the end of 2019, central banks representing a fifth of the world's population reported that they were likely to issue CBDCs in the near future.[1]
- The number of central banks that are likely to issue a retail CBDC over the next couple of years doubled in 2019, to 20%.[2]
- By October 2020, 80% of surveyed central banks indicated that they are engaging in research, experimentation or development of CBDCs.
- The interest in CBDCs appears to have been fuelled by the COVID-19 pandemic.
- Eighty-one countries that represent over 90% percent of global GDP are now exploring a CBDC.
- In May 2020, only 35 countries were considering a CBDC.[2]
- A January 2021 report by the Bank of International Settlements indicated that of the 65 central banks surveyed in 2020 regarding their interest in CBDC, over 55 of them were exploring general purpose (i.e., retail) CBDC, of which 15 have either launched, piloted or are in the very advanced stages of exploring CBDCs.[3]
- Safety measures such as social distancing, public concerns that traditional currencies may transmit the COVID-19 virus, and new government-to-person payment schemes have accelerated the use of digital payments.

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Account-based v. Token-based

- A CBDC is a digital payment instrument, denominated in the national unit of account, that is a directly liability of the country's central bank.
- CBDC can be account-based or token-based, the former involving the transfer of a claim on an account and the latter of a token between digital wallets.

Account-Based

- A transaction in account-based CBDC would entail the movement of currency based on the transfer of a claim from one account to another and would resemble transactions typically occurring between commercial bank depositors, except the accounts would be held with the central bank.
- A payer would access its account at the central bank and request a transfer of funds to a recipient's account also at the central bank, with the central bank ensuring settlement by updating a master ledger after verifying the payer's authority to use the account, sufficient funds in the payer's account, and the identity and authenticity of the payee's account.

Token-Based

- A token-based CBDC would involve the transfer of an asset from one wallet to another; physical cash and many digital assets are examples of a token-based currency.
- More importantly, a token-based CBDC would rely on the ability of the payee to verify the validity of the CBDC.
- With cash, the worry is counterfeiting while, digitally, the worry is whether the token is genuine and whether the token has already been spent.

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Centralized v. Decentralized

Centralized Ledger

- A centralized ledger would require an intermediary to manage and transfer the liabilities, which likely would mean, for the United States, the Fed (as the U.S. central bank) would serve as the intermediary and be the controller of token distribution and/or account management.
- In a token-based system, the Fed would take on the role of the validator for the technology that facilitates the distribution of the CBDC.
- In an account-based system, centralization would mean that the Fed would serve as the administrator of all accounts and would take on the responsibility of verifying all account holders.

Decentralized Ledger

- A decentralized ledger refers to a system where the central bank delegates responsibility to other parties (like private commercial banks).
- In a token-based system, third parties (such as commercial banks) would replace the central bank as validators within the technology infrastructure that facilitates the transfer and validation of CBDC-based transactions.
- In an account-based system, decentralization involves third parties that are responsible for managing user accounts.

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CBDC Models in Development

- As of July 2021, there are five pioneering jurisdictions that have either fully launched a CBDC or have launched a pilot, including China.[4]
- Fourteen other countries, including major economies like Sweden and South Korea, are now in the pilot stage with their CBDCs and preparing a possible full launch.[5]
- Nearly all of the G20 countries are in some stage of development of a CBDC.
- There is no uniformity as to the reasons why central banks are exploring CBDC.
- Some are exploring CBDCs in the hope of bringing more investors to their financial system, while others are concerned about the growth of non-government sponsored digital currencies and the potential impact of those private currencies on monetary policy.
- Several governments, including China, may view CBDCs as a potentially powerful surveillance tool.
- Finally, other countries including the United States view CBDCs as a tool to promote financial inclusion.
- The CBDC projects in Sweden, Canada, and China are instructive examples of the efforts of central banks in this area.

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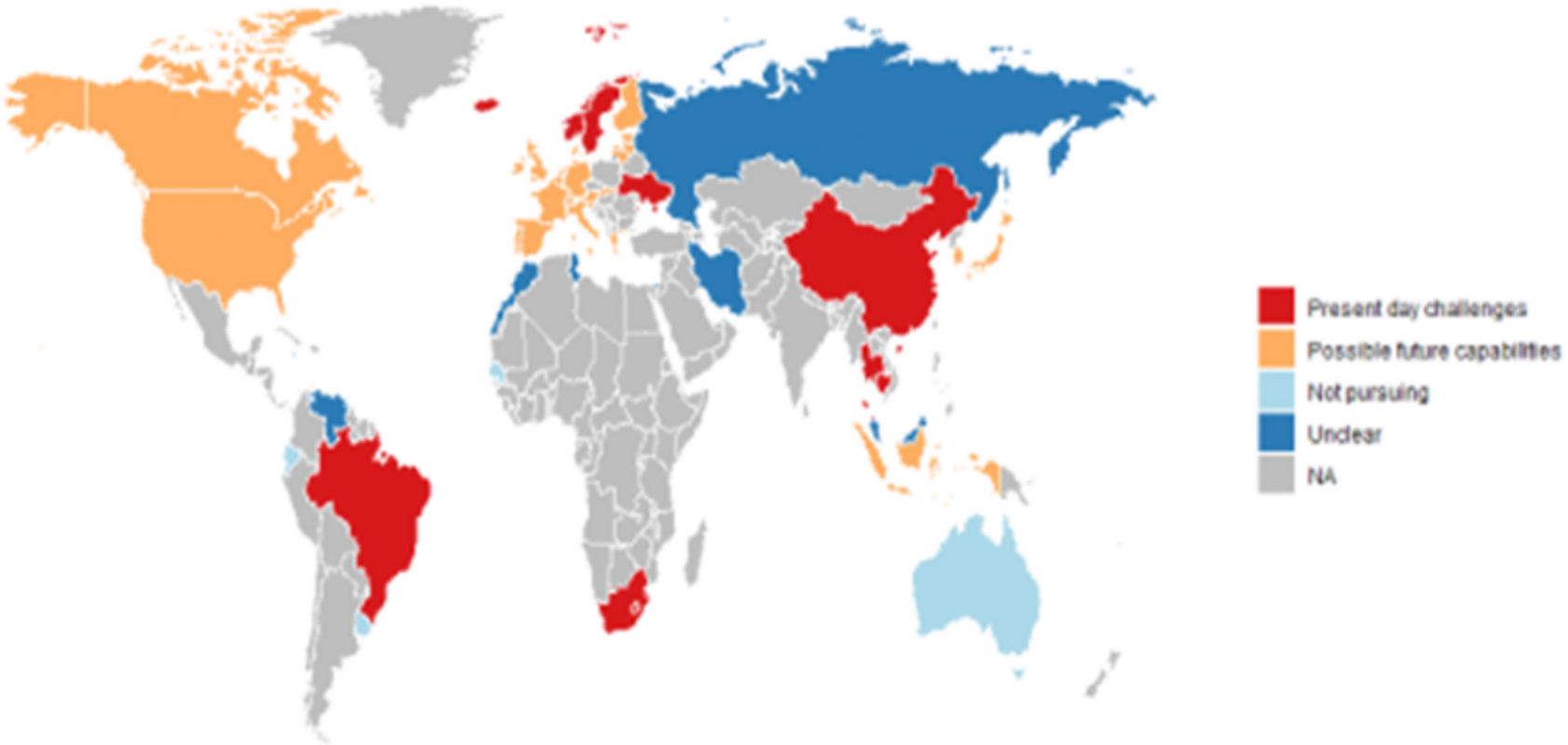
CBDCs

- Primary motivations for CBDC research and experimentation.



Source: Preconditions for a general-purpose central bank digital currency

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Sweden

- The first publicly announced work on retail CBDCs was conducted by the Swedish Riksbank, the world's oldest central bank.[6]
- In Sweden, cash use has been declining in recent years, and the Riksbank has initiated a societal discussion on access to a central bank payments instrument for the general public.
- Sweden is a highly digital economy and so cash use has been on the decline for some years, to the extent that an increasing number of shops are no longer accepting cash at all.
- Noting that its economy is witnessing "the greatest and fastest decline in cash worldwide",[7] the Riksbank was at the global forefront of discussing the possibility of issuing a CBDC.[8]
- Currently, Sweden is developing a proof of concept of the e-krona project.
- The CBDC will be intended as a complement to, not a replacement for, cash.
- Over time, this "e-krona" project has been further developed.

Sweden

- The e-krona will offer the general public continued access to state money, but in digital form in an effort to promote safer and more efficient payment systems as more and more persons no longer use cash as a means of payment.
- In May 2021, Sweden moved forward with a trial of its CBDC between its central bank and a live retail bank chain, Handelsbanken, based in Sweden.[9]
- The architecture of the current Riksbank proof of concept is a hybrid CBDC.
- The CBDC is a direct claim on the Riksbank and payments are operated by payment service operators.
- The ongoing pilot is a "decentralised database of all e-kronor in circulation at any given moment, where the Riksbank verifies all transactions before completion".[10]
- The infrastructure and technical implementation are based on the Corda blockchain developed by R3.
- The e-krona is focused on the domestic market, and retail use by non-residents will only occur via the use of pre-paid cards by tourists for small purchases.

Sweden

Business

Sweden to bring in banks in next stage of e-krona project

2:37 PM EEST

FINANCE • CENTRAL BANKS

Inside Sweden's ambitious plan to turn the krona into digital currency—and fend off the rise of crypto coins

April 9, 2021 5:15 PM GMT+3

Source: eKrona™ - Official Website 2021 | eKrona.com

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Canada

- The Bank of Canada has done an extensive amount of work on digital currencies.
- Canada was one of the first countries to explore the development of a CBDC.
- The Bank of Canada has not indicated that it is developing a retail CBDC,[11] but Canada has identified the conditions under which it would develop a CBDC[12] and also described possible designs.
- The Bank of Canada has considered scenarios in which (i) the use of physical cash is reduced or eliminated altogether, and (ii) a private cryptocurrency makes substantial inroads as a means of payment.
- The Bank of Canada is engaging in discussions with stakeholders, universities, and firms on the design of a CBDC.
- The overall aim of the design of the CBDC is a digital claim on the Bank of Canada that closely mimics the properties of physical cash.
- The CBDC would not replace cash but rather designed as a digital addition with advantageous resilience and accessibility features.[13]

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Canada

- The Bank of Canada is exploring three potential models:
  - A direct CBDC (the Bank of Canada providing the entire CBDC payment system);
  - A hybrid CBDC (the Bank of Canada only issuing and redeeming CBDC, with private sector intermediaries providing end user services); and
  - The intermediated CBDC (identical to the hybrid model, where the Bank of Canada does not have access to the full ledger of retail transactions).
- The Bank of Canada is also exploring a hybrid option in which intermediaries execute the majority of payments, but the Bank of Canada can conduct some retail payments.[14]

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China

- China was the first leading economy to explore CBDCs, including general purpose CBDCs.
- The CBDC being developed by the People's Bank of China ("PBC"), the Digital Currency Electronic Payment ("DC/EP" or "digital yuan"), is the most advanced CBDC project.
- The DC/EP is currently being offered in four cities in China.
- DC/EP is available to the public and foreign visitors, and functions like cash as a liability of the PBC.[15]
- The DC/EP is a centralised, digital currency issued by the PBC and is expected to be primarily used for retail payments in China.
- China is positioning the DC/EP for international use and designing it to be untethered to the global financial system, where the U.S. dollar has been primary currency for transactions since World War II.
- Since April 2020, this system is being tested in the context of a large-scale pilot and has not been revealed countrywide to the approximately 1.4 billion Chinese citizens but, instead, is open to selected entities in the whole country.[16]

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China

- The pilot is continuously being expanded to allow an increasing number of households, banks, companies, merchants, etc. into the infrastructure.[17]
- In contrast to other CBDCs, the DC/EP is not based on a distributed ledger, but provides capabilities to build distributed ledger technology applications on top of the centralised infrastructure.
- On April 20, 2020, a PBC spokesperson confirmed that pilot testing was under way in several cities – Shenzhen, Suzhou, Chengdu, Xiong'an, and the "2022 Winter Olympics Office Area" in Beijing.[18]
- In China, the introduction of a CBDC should be seen in the context of a highly digitised economy and widespread use of private digital payment services.
- The backbone of the DC/EP's infrastructure would be a mixed system with conventional database and blockchain.
- The PBC has emphasised that blockchain is not yet sufficiently mature for such a large-scale application.

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China

- The PBC has taken steps to enable the use of DC/EP in cross-border transactions.
- Aiming for broad circulation in 2022, the PBC and the Hong Kong Monetary Authority began “technical testing” for use of the DC/EP in April 2021.
- China has conducted more than $5 billion in DC/EP transactions.[19]
- The PBC has also announced that it will allow foreign visitors to use DC/EP in the lead-up to the 2022 Winter Olympics.
- It appears that foreigners will need to provide passport information to the PBC and/or private payment service providers in order to use DC/EP, but will not need a Chinese bank account.[20]

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China

- China's CBDC has been used to conduct 62 billion yuan ($9.7 billion) of transactions as of the end of October.
- A People's Bank of China ("PBC") official said in early November 2021 that 140 million people had opened wallets for the digital yuan, or "eCNY," according to a report by Reuters.
- Mu Changchun, director-general of the digital currency institute of China's central bank, told Hong Kong's Fintech Week conference that over 1.5 million merchants could accept payments using eCNY wallets.
- In addition, 10 million corporate accounts have been created, Bloomberg reported.
- The figures compare with those at the end of June, when there were 34 million individual and corporate eCNY wallet users who had conducted transactions worth $5.4 billion, according to Bloomberg.

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United States

- Unlike China, which has launched a pilot CBDC, the United States is *exploring* the potential legal and regulatory issues associated with the creation of a digital currency.
- "Of the countries with the largest central banks (the US Federal Reserve, the European Central Bank, the Bank of Japan, and the Bank of England), the United States is *furthest behind* [in the development of a CBDC]."[21]
- Earlier this month, the European Central Bank announced its intention to develop a digital euro within four years.[22]
- In May 2021, Federal Reserve Chair Jerome Powell announced plans to publish a discussion paper on CBDC, focusing on the *possibility* of issuing a U.S. CBDC.
- Chairman Powell believed that a potential CBDC would complement the use of cash and bank deposits rather than replacing them.
- The Chairman has said that the Federal Reserve's research into CBDCs is early and exploratory, and that U.S. officials would only consider issuing a digital dollar if they believed there was a clear use and if the idea had widespread public and political buy-in.[23]

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United States

- Most discussions of CBDC assume that the digital currency would be treated as currency of the United States and would therefore have legal tender status.
- Federal law provides that U.S. coins and currency (including Federal Reserve notes and circulating notes of Federal Reserve Banks and national banks) are legal tender for "all debts, public charges, taxes, and dues".[24]
- Federal Reserve notes must be accepted by creditors as valid for the payment of both public and private debts. U.S. law, however, does not require a person to accept legal tender for goods or services and does not prohibit the acceptance of other forms of "money" to extinguish a debt.[25]
- A CBDC's recognition as legal tender would not guarantee its acceptance in commercial use.
- Acceptance of a CBDC would depend on the credibility of the CBDC, including the soundness of the legal framework underpinning it (for example, commercial law rules that facilitate market activities).[26]

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Central Bank Mandate

- Central banks have a common mandate for facilitating monetary and financial stability to ensure a safe and sound financial system.
- Although policies and regulations to achieve this mandate may be idiosyncratic to the jurisdiction, every central bank observes three foundational principles when considering the issuance of a CBDC in their jurisdiction:[27]
  - **Do no harm** – New forms of money supplied by the central bank should continue supporting the fulfilment of public policy objectives and should not interfere with or impede a central bank's ability to carry out its mandate.
  - **Coexistence** – Different types of central bank money – new (CBDC) and existing (cash, reserve or settlement accounts) – should complement one another and coexist with private money (commercial bank accounts).
  - **Innovation and Efficiency** – Without continued innovation and competition to drive efficiency in a jurisdiction's payment system, users may adopt other, less safe instruments or currencies.
- Depending on the design and structure of a CBDC, its introduction into the financial system may lead to broad, macroeconomic effects.

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Policy Issues to Consider

- Monetary and Financial Stability
- Bank disintermediation - A potential by-product of widespread adoption of CBDC in a country is the risk of bank disintermediation, particularly during times of economic stress.
- Bank runs - The existence of a CBDC could facilitate “digital runs” towards the central bank because, even with presence of deposit insurance, CBDCs would almost always be the safer alternative. The presence of such a safe alternative, the incentives to run away from traditional financial institutions and towards the central bank, may increase with the introduction of a CBDC.
- Privacy

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Next Steps for the United States

- On August 13, 2020, the Federal Reserve Bank of Boston announced a *multiyear* collaboration with the Digital Currency Initiative at the Massachusetts Institute of Technology ("MIT") to perform technical research related to a CBDC.
- The research project is focused on exploring the use of existing and new technologies to build and test a hypothetical digital currency platform.[28]
- The Boston Federal Reserve and MIT have structured the research collaboration into work phases that extend over two to three years.
- The first phase involves jointly building and testing a hypothetical CBDC for widescale, general purpose use.
- The objective in this phase is to determine how to architect a scalable, accessible cryptographic platform to meet the needs of a theoretical U.S. CBDC, including stringent design requirements for speed, security, privacy and resiliency.[29]
- In later phases, researchers will assess technology trade-offs by coding and testing various architectures, to see how they impact the CBDC's design goals.

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Conclusion

- The issuance of a CBDC requires extensive planning and a firm understanding of the potential legal, economic, social, and political effects of such action.
- It is understandable that countries such as the United States are taking a judicious approach with respect to the development of CBDCs.
- However, a measured approach should be balanced against the fact that several countries, most notably China, are in advanced stages in the development of a CBDC.
- Countries that have traditionally played a leading role in the development of the global financial system are behind countries that are pursuing the development of CBDCs and may therefore risk a diminished role in the global economy.
- The United States can take meaningful action on the development of a CBDC and to continue its leadership role in the development of the global monetary system and the global economy.

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