Hands-on CBDC experiments and considerations – a view from the Bank of Thailand

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Main objectives of introducing CBDC

The rapid development of financial technology has initiated wide-ranging dialogues and considerations on the appropriate architecture for the financial system. For many central banks, the challenge lies in how best to harness the benefits of technological advances while minimising risks. At the Bank of Thailand (BOT), we believe that technology can help address long-standing pain points within the wider financial system, especially in terms of improving efficiency, access and inclusion.

Central bank digital currencies (CBDCs) are one promising form of technology-enabled money that we believe has the power to change the future financial landscape. The BOT foresees CBDC as a having the potential to: 1) become a reliable and trustworthy digital form of central bank money to better serve consumer needs in an increasingly digital economy; and 2) provide the foundation for Thailand's future financial infrastructure. Leveraging upon the CBDC infrastructure, private sector participants could potentially build diverse and innovative financial services. CBDC could lay the groundwork for interoperability and close collaboration with banks and non-banks alike to usher in a new era of financial innovation in Thailand.

CBDC journey and experiments

With the above objectives in mind, the BOT has been a fast mover in researching and developing CBDC through continuous engagement and cooperation with industry partners as well as other central banks. Our CBDC journey began in 2018 with Project Inthanon, where we joined hands with eight domestic commercial banks. In Inthanon Phases 1 and 2, we developed a proof of concept (PoC) for a real-time gross settlement (RTGS) system using distributed ledger technology (DLT), which was able to successfully carry out basic payment functionalities within the interbank market, as well as more complex and innovative features using smart contracts.

In Phase 3, Project Inthanon-LionRock, the BOT joined hands with the Hong Kong Monetary Authority to develop a PoC cross-border corridor network, where funds transfers between Thai and Hong Kong banks can occur instantaneously on a P2P basis, eliminating settlement risk. Our design also allowed for FX price discovery in the corridor network, enabling on-demand FX conversion and settlement.

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After the completion of Inthanon-LionRock, we wished to scale our corridor network to include more currencies and jurisdictions to simulate real world conditions as best as possible. Therefore, in early 2021, we welcomed the Digital Currency Institute of the People's Bank of China and the Central Bank of the United Arab Emirates and embarked on an extension of Inthanon-LionRock, renamed as the m-CBDC Bridge project, or mBridge for short. The project is supported and overseen by the BIS Innovation Hub Hong Kong Centre. Going forward, mBridge will continue to explore and conduct experiments to resolve existing limitations of the current system, related to privacy controls, liquidity management and the scalability and performance of DLT in handling large transaction volumes. In addition, mBridge will incorporate policy requirements and compliance with jurisdiction-specific regulations into the system, along with laying down appropriate governance for a more complex structure and controls.

Since early 2021, the BOT has also been actively exploring retail CBDC alongside our wholesale projects. After collection and consideration of industry feedback, we have successfully completed a PoC for a retail CBDC prototype. In the next step, we expect to launch a small-scale pilot in the second half of 2022 to test the prototype's performance in a real-life environment as well as collecting data on user behaviour patterns and feedback, which will be important steps towards fine-tuning the CBDC design for future wider adoption and mitigating any risks involved.

Guiding principles for retail CBDC design

Retail CBDC must be designed to be beneficial for Thai citizens and appropriate to the Thai context. The design must not result in adverse effects on monetary policy or overall financial stability. In this regard, the following design characteristics for retail CBDC are most suitable:

1. Should be cash-like and accessible by all segments of the Thai population to conduct financial transactions, while also considering those without internet access.
2. Should not impose any financial costs on end users and should be open to all participants willing to build innovative financial services on top of it, such as programmability features.
3. Intermediaries, such as financial institutions and financial service providers, should be able to distribute retail CBDC given their expertise in know-your-customer (KYC) processes with businesses and retail consumers.
4. Should not bear interest and should have certain holding or conversion limits to prevent bank runs during distressed periods and money laundering.

   Should utilise the advantages of both centralised and decentralised technology, as centralised technology can support large volumes of transactions while decentralised technology can provide greater resiliency with cryptographic techniques to enhance security.

Implications for monetary policy and financial stability in Thailand

Money supply and central bank balance sheet

We predict that future widespread public adoption of retail CBDC may affect the money supply in the economy and the central bank's balance sheet, but these impacts will probably be limited. If retail CBDC were to widely replace cash, the amount of money issued by the central bank (monetary base) would largely remain unchanged. However, if retail CBDC were to widely replace e-money, the monetary base would expand. Deposits of e-money service providers held at financial institutions would be converted to retail CBDC, resulting in smaller proportions of privately issued money. Regardless, the overall money supply in the system (the total amount of money issued by the central bank and private sector) would remain unchanged.

It is worth noting that the issuance of retail CBDC may change the composition of the central bank's and financial institutions' balance sheets. However, given the expected gradual uptake, they would have time to adapt to these changes.

Monetary policy transmission

The issuance of retail CBDC would help maintain monetary policy effectiveness by enhancing the efficiency of fiat money. If the usage of alternative digital currencies as money becomes widespread, the role of central bank money in the economy and the role of financial intermediaries in the future may be reduced, affecting monetary policy effectiveness. Central banks around the world are exploring ways in which retail CBDC, equipped with programmability features, could enhance monetary policy transmission or become a new monetary policy tool given some limitations of the current tools. For instance, tying retail CBDC remuneration to the central bank's policy rate could improve transmission to financial institutions' interest rates. However, the pros and cons must be carefully assessed further.

Financial stability

The BOT emphasises the following key risks associated with CBDC:

1) Liquidity risk: rapid and large conversions of deposits to retail CBDC that may lead to panic runs among depositors and ultimately impact financial institutions' liquidity should be prevented. Measures must be established to mitigate this risk, such as setting conversion limits or increasing liquidity assistance channels for financial institutions.

2) Disintermediation risk: retail CBDC must not disintermediate the role of financial institutions. Disintermediation may occur when consumers convert large amounts of deposits into retail CBDC, reducing deposit funding or raising financial institutions' costs of funds and hence also increasing the costs of their lending to businesses and consumers. However, this risk is low as total deposits of the Thai financial institutions system have consistently exceeded total loans, reflecting financial institutions' ability to extend further loans. In addition, we

anticipate that the general public would still prefer to hold deposits with financial institutions to earn interest and access other financial services.

Cross-border aspects of CBDC

There are multiple policy challenges if CBDCs are to be used across borders. The first and foremost challenge will be how to address the implications for capital flow management and how to establish safeguard measures to protect each jurisdiction's monetary sovereignty. Specifically, requirements should deter local CBDCs from being internationalised by foreign players, as well as limiting the amount of foreign CBDC usage in domestic markets to prevent currency substitution.

In addition, many central banks are now involved in multiple-CBDC network projects, similar to the mBridge Project mentioned above. For such projects, central banks will have to work together closely to find how to incorporate the many diverse jurisdiction-specific compliance regulations and formats, how to achieve privacy and liquidity provision requirements when there are more currencies involved, and how to establish a robust governance structure, appropriate participation criteria and an incentive/fee model. The success of these projects will ultimately depend on network effects and their ability to interoperate with payment rails across many jurisdictions.