

JCER Working Paper

AEPR series

No. 2021-2-2

This paper is under review for possible publication in the Asian Economic Policy Review and is not the final peer reviewed version.

Implications of Central Bank Digital Currency:
The Case of China e-CNY

Jianguo Xu

(Peking University)

This paper was prepared for the Twenty-fourth Asian Economic Policy Review (AEPR) Conference “Digital Finance” on October 1, 2021, via zoom.

October 2021

Asian Economic Policy Review
Japan Center for Economic Research



To authors

If you want to introduce the same working paper you wrote and presented at the AEPR conference held via zoom on Oct. 1, 2021, in your own/your affiliation's website, please be aware the following requirements.

To ensure that all citations and references to your published article are captured by the SSCI (Social Sciences Citation Index), authors are required to amend the cover page of your working paper as soon as practical after publication in AEPR. The amended cover page should include the full article citation, journal name, volume and issue, and DOI, as well as a hyperlink to the published article. Here is an example of an amended working paper cover page.

JCER Working Paper

AEPR series

No.●●●

This is the pre-peer-reviewed version of the following article

“Japan's New Foreign Economic Policy: A Shift Toward a Strategic and Activist Model?”, *Asian Economic Policy Review*, vol. 2, issue 2, which has been published in final form at <http://onlinelibrary.wiley.com/doi/10.1111/j.1748-3131.2007.00071.x/abstract> and DOI: 10.1111/j.1748-3131.2007.00071.x.

Full
Cite

Link to final article

Implications of Central Bank Digital Currency: The Case of China e-CNY

Jianguo Xu¹
Institute of Digital Finance
Peking University
2021.09.10

(Preliminary draft, please do not circulate)

Abstract

China have been both active and cautious in developing central bank digital currency (CBDC). China CBDC has been in research and development since 2014. It is currently at the stage of expanding real field experiments. It is centralized digital cash designed to gradually replace traditional paper cash and coins (M0). It will be supported by the traditional two-layer banking system. It is not blockchain based at issuance but is technology neutral in distribution. Internet and technology companies may join commercial banks in distributing China CBDC. In the short run, China CBDC will help improve domestic financial monitoring and policy implementation. In the long run, it may play a role in RMB internationalization or even international monetary system evolution.

¹ The author thanks colleagues at the Institute of Digital Finance, Peking University for helpful comments and discussions. Special thanks goes to Yiping Huang and Huixuan Li. The author is solely responsible for remaining errors and inaccuracies. Please direct comments to jgxu@nsd.pku.edu.cn.

The emergence of Bitcoin in 2009 popularized the idea of digital money. Since then, digital money have developed along three lines: cryptocurrencies, stable coins, and central bank digital currencies (CBDCs).² Up to mid-2021, cryptocurrencies and stable coins have increased tremendously in issuance and market value. Development of CBDCs have relatively lagged behind. Only a few small economies have issued CBDCs. However, most major central banks are actively involved in development of CBDCs. Although the future path of digital money is still under debate, the importance of digital money and its impact on the existing monetary system is well recognized.

Nowadays it is generally agreed that the current monetary system is under quick evolution, in both the domestic and the international dimensions. The idea of digital money initially originates from the tech-oriented cryptocurrency community and gradually spreads to the general public. Even the policy discussion community now publicly admits that the current monetary system is not sustainable. For example, in a speech on 2019 Jackson Hole Symposium in August 2019, the former Bank of England governor, Mark Carney, acknowledged there will be a change in the unsustainable monetary system.

By now, it is also clear to both the academic and policy community that private cryptocurrencies, such as Bitcoin, Litecoin, and Ripple, cannot be the main currencies for the future monetary system. There are at least three reasons. First, blockchain-based cryptocurrencies cannot handle large amounts simultaneous

² Broadly speaking, all three lines are cryptocurrencies. Throughout this paper, we use the term cryptocurrency narrowly to refer to blockchain and private based cryptocurrencies such as Bitcoin and Litecoin.

transactions. Second, cryptocurrency will affect the effectiveness of monetary policy in an unknown way. Third, and most importantly, the privilege to issue money has to be in the hand of governments (Krugman, 2013; Yermack, 2015; Böhme et al., 2015). Therefore, although cryptocurrencies have achieved great successes, they do not represent the future of monetary system.

Confronting this fast change and challenge, worldwide central banks begin to initiate projects on central bank digital currencies (CBDC). According to a survey of 66 central banks released in January 2020 by the Bank for International Settlements (BIS), a full 80% of surveyed central banks engage in research, experimentation, or development of CBDCs. Among them, Norway, Sweden, Finland, Canada, The European Central Bank, England, Singapore, and China are at relatively more advanced stages. The Federal Reserve of the United States is seemingly a bit slow in CBDC. However, it has officially also begun to conduct research on CBDC in early 2020. The project on Fedcoin is resumed.

In this paper, we discuss the development and implications of China CBDC. The People's Bank of China begin to conduct research into CBDC as early as in 2014. In 2020, China begin to conduct real field experiment of CBDC in selected areas. As of September 2021, China CBDC is at the stage of expanding the scope of real field experiment. It is expected that international residents participating in the forthcoming 2022 Winter Olympics may use China CBDC. After that, China may officially introduce CNBC soon if the field experiments proceed smoothly. It is possible that China may be the first major economy to officially launch CBDC.

Given the significance of China economy and China currency, it is quite important to keep a close eye on China CBDC.

Our discussion can be split into two parts. In the first part, we will briefly look at what we already know about China's CBDC. All the discussions are based on publicly available information. We compile publicly released facts. In the second part, we will discuss possible future evolutions and implications of CBDC. In this part, the author will allow himself more space for inferences and speculations. Up front, the author wishes to acknowledge that these inferences and speculations could be quite inaccurate. Future evolutions may take alternative paths that are quite different. However, given the importance of CBDC and the lack of publicly available actual data, the author argues that these inferences and speculations are still necessary and could provide some benchmark for future observations and discussions.³ At the very least, we should have a rough idea of what the evolution path may look like and be ready when a different path is taken.

Before we go into the details, it is helpful to preview the key features of China's central bank digital currency.

- 1) It is referred to as digital currency/electronic payment (DC/EP) in the research progress. Its final name is e-CNY, meaning electronic Chinese Yuan. e-CNY will have the same value as traditional CNY with the same face value.

³ Since China have launched large scale real field experiments, transaction data for CBDC actually exist. They are just not released for public research.

- 2) Technically, e-CNY is simply encrypted character strings. Given the current stage of computing power and encryption technology, e-CNY's encryption can be considered safe in the sense that it cannot be decrypted in reasonable amount of time.
- 3) Monetarily, e-CNY is supposed to be M0 and gradually replace traditional paper cash and coins. This is why its official name is e-CNY.
- 4) e-CNY will be distributed via the traditional two-layer banking system consisting of the central bank and commercial banks. It is possible that communication and internet companies may join commercial banks in distributing e-CNY.
- 5) In the short run, e-CNY will help improve domestic financial monitoring such as anti-corruption, anti-tax evasion, anti-money laundry. It may also help policy implementation such as subsidy distribution.
- 6) e-CNY's role in RMB internationalization will be limited in the near future. RMB internationalization will depend on its acceptance in the international community. Digitalization may facilitate this process by reducing distributing costs.

The rest of this paper is organized as the following. Section 1 briefly reviews the history of e-CNY research and development. Section 2 introduces the key features about e-CNY, compiled from publicly available information. Section 3 compares e-CNY with other digital currencies such as bitcoin and Libra. Sections 2 and 3 are the *fact* part of this chapter. Section 4 discusses some potential influences of e-CNY. Section 5 summarizes.

01. China's CBDC: A brief retrospect

The People's Bank of China (PBoC) began to look into digital currency as early as 2014. Mr. Zhou Xiaochuan, then the governor of the People's Bank of China, is an enthusiastic proponent of CBDC. As an institutional support, the People's Bank of China set up the Institute for Digital Currency (IDC) in 2017.

In 2019, the research and development of CBDC is speeded up. In July 2019, the State Council officially authorizes the research and development of CBDC and designates PBoC to take a lead on this project. PBoC conducts the work with the help of market institutions, including commercial banks and fintech companies such as Tencent, Alibaba. The three major Telecommunication companies, i.e., China Telecom, China Mobile, and China Unicom, are also involved in the research and development.

In the next few months, discussions about China CBDC begin to accumulate more heat and attract more attention. PBoC officers begin to disclose more information about its research and development. The name for the research scheme, digital currency/electronic payment (DC/EP), is officially used in public forums and writings. For example, Mr. Mu Changchun, director of the Payment System Department of PBoC, announced that China's DC/EP is in advanced stage the product (e-CNY) is "almost ready" in a public forum at Yichun, Helongjiang. Mr. Fan Yifei, the vice governor of PBoC in charge of payment, also write publicly to introduce and promote DC/EP. By official statistics, PBOC's Institute for Digital

Currency has obtained 74 patents by August 21, 2019. Private companies such as Alibaba have also obtained patents related to digital currencies.

In April 2020, a picture of pilot usage of e-CNY was circulated on the internet. It becomes public that PBoC has begun to test e-CNY in contained environments. PBoC officers confirmed that such tests are conducted in 4 selected cities, Shenzhen, Suzhou, Chengdu, and Xiong'an. The test will also be conducted in the 2022 Winter Olympic Games in Chongli, Hebei Province of China.

In the next step, China began to test e-CNY by issuing to a relatively large number of users but still in a contained environment, officially called pilot programs. This is achieved by sending e-CNY to randomly selected residents in selected cities of experiments.

On October 8, such an experiment is conducted in Shenzhen, China. 10 million worth of e-CNY is sent to 50,000 randomly selected Shenzhen residents, each of whom gets 200 yuan. The money can be spent freely at 3389 offline shops in Shenzhen. Unspent money will be recollected by 24:00 pm, October 18. The big-four state-owned commercial banks, i.e., Industrial and Commercial Bank of China (ICBC), Agricultural Bank of China (ABC), Bank of China (BOC), China Construction Bank (CCB), participate in the experiment. To differentiate from each other, the four banks design their digital wallets in different colors.

On December 15, 2020, a similar experiment is conducted in Suzhou, China. 20 million e-CNY is sent to 100,000 randomly selected residents, doubling the size

of the experiment in Shenzhen. Unspent e-CNY will be recollected on December 28. This time, in addition to more than 5000 offline shops, the money can also be spent on JD.com, a large online digital shop. It also supports offline payments via Bluetooth and NFC (Near Field Communication). Besides, two other big state-owned commercial banks, Bank of Communications and Postal Savings Bank of China, also joined the experiment. So the big-six state-owned commercial banks all participated in this experiments. As we will discuss shortly, commercial banks will play an important role in China's e-CNY system.

In these two experiments, 150,000 residents tried 30 million total worth of DC/EP in both offline and online shops. Such experiments will help accumulate a large amount of data for further examination. To the best of my knowledge, this is by far the largest scale real field experiment of CBDC.

Starting from November 2020, Shanghai, Hainan, Changsha, Xi'an, Qingdao and Dalian joined in the pilot. As of June 30, 2021, e-CNY has been applied in over 1.32 million scenarios, covering utility payment, catering service, transportation, shopping, and government services. More than 20.87 million personal wallets and over 3.51 million corporate wallets had been opened, with transaction volume totaling 70.75 million and transaction value approximating RMB34.5 billion.

In addition to China, other countries have also tested or launched CBDC in 2020. Swedish CBDC, e-Kroner, has also been tested in an isolated environment since March, 2020. The first officially launched CBDC is the Sand Dollar, i.e. a digital version of Bahamian Dollar, which was officially launched by the Central

Bank of The Bahamas in October 2020. All residents in Bahamas can access the digital wallet through the mobile application or a physical payment card.

In retrospect, the year 2020 may well mark the first year of CBDC issuance. Given the potential importance of CBDC, this is a landmark year on human monetary history. In 2020, the world attention focuses on Covid-2019 pandemic. In a few years, the Covid-2019 pandemic will be long over and probably forgotten. However, CBDC will be issued in many countries and greatly affect the human financial system. It may well be the case that 2020 is not the year of Covid virus. It is the year of CBDC.

02. What does e-CNY look like?

Based on official lectures and writings of PBoC officers, we can compile some facts about e-CNY. This part of the discussion draws heavily on published papers of PBoC officers, such as Fan (2018), Yao (2018, 2019) and Mu (2019). Particularly, PBoC published a report on progress of research and development of E-CNY in China in July 2021. We draw heavily on this report too. As we will see, e-CNY is structurally similar to RScoin proposed by the Bank of England in 2015 (Danezis and Meiklejohn (2015), Broadbent (2016)). It is a digital cash operated by the existent double-layer banking system.

First, the nature of e-CNY is digital cash. Technically, it is encrypted character strings. Taking advantage of progresses in asymmetric encryption, it is very difficult to decode the encrypts. With careful designs and before further

developments in computing technology, nowadays such encryption can be considered as safe in the sense that it cannot be decrypted in reasonable amount of time. With careful design of firewalls and close monitoring of the system, attempt to crack down the system can be quickly identified and anti-cracking efforts can be taken.

Monetarily, e-CNY can be considered as digital versions of traditional paper cash. Therefore, it is understandable that its final name is e-CNY rather than DC/EP which has been used earlier. Now the name DC/EP is used to refer to the whole research scheme. By design, e-CNY is supposed to gradually replace traditional paper cash. Since a large percent of people do not use smart phones, such replacement will be gradual. This is especially true for elder people and people in underdeveloped areas, such as in rural area or in western China. According to data from the China Internet Network Information Center (CNNIC), there are about 0.9 billion smart phone users by the end of 2019. In other words, there are about 0.5 billion people in China who still do not use smart phones. Mr. Fan Yifei, PBoC vice governor, confirmed that e-CNY and CNY (traditional Chinese Yuan) would co-exist for a very long period of time.

Second, e-CNY is token-based rather than account-based. As we discussed earlier, e-CNY is encrypted character strings. Therefore, it has to be stored in a smart phone APP or another device, which naturally can be linked to an account. However, this is different from account-based in two aspects. First, the token can be separated from the account in the sense that it is independent character strings that can be examined and accepted (or denied) by another smart phone. This is

especially useful when both phones are off-line, i.e., not connected to the internet. Second, the e-CNY device (smart phone or other device) can be separated from individual or other types of user. Therefore, the money can be semi-separated from the user. Because of the two reasons, the design is also referred to as semi-account-based. That is, it is related to an account, but can be independent from the account sometimes.

Third, e-CNY will be distributed and supported by a double-layer operating system, including the central bank at the root and commercial banks at the tree. In other words, e-CNY will be supported the traditional double-layer banking system. The central bank issues the money to commercial banks. Then the commercial banks deal with households, firms, and other entities. When commercial banks get e-CNY from the central bank, they need to deposit 100% cash as reserves. In other words, e-CNY will not affect M0 supply directly.

We emphasize the term “directly” when saying e-CNY will not affect M0 because the indirect effect of e-CNY on money supply is rather complicated could be very significant. This applies to all scopes of money supply. e-CNY may reduce M0 because faster money circulation lead to less “cash” necessary. The tractability of e-CNY make it less appealing for grey market transactions, which further reduce demand for M0. As to M1 and M2, the effect is more complicated because the commercial banking system may be greatly affected. In addition, behavior of individuals and corporations may be greatly affected as well.

One modification to the two-layer banking system is that in the future non-commercial banks, such as big Fintech companies and telecommunication companies, also participate in distributing e-CNY to the general public. This is confirmed in PBoC officers' public speeches and public research statements. If doing so, the Fintech and telecommunication companies also need to deposit 100% reserves. However, without a banking license, they can only provide payment services. They cannot absorb deposits from the residents or issue loans to firms and households.

This discussion tells us one possible important change after e-CNY is introduced. Traditionally, commercial banks provide three lines of services: deposits, payment, and loans. After the fast development of third-party payment in recent years, it is clear that payment services can be split out from commercial banks. In fact, payment service is the area where Fintech have been developing fast. This is true not only in China but also all over the world, especially in financially underdeveloped areas.

A second thought suggests that deposit services can also be split out from commercial banks. Residents can directly buy investment services from specialized providers such as mutual funds. Loans can also be split out. Whoever has information about firm credibility can help facilitate loan issuance. In fact, we already see big-tech companies such as Alibaba play an important role in loan issuance. With the introduction of e-CNY, fund flows will be more precisely recorded and could be made accessible to a wide range of data analysts. Loan issuance can be conducted based more on data analysis and less on local soft

information such as personal connections. With a bit of stretch, the author speculates that the future banking business may be quite different from the past.

In addition to the double-layer banking system, an alternative single-layer system, in which the central bank issues e-CNY directly to residents, has been discussed but quickly abandoned. Obviously, given the large population size in China, this alternative plan is technically complicated and challenging. It is extremely difficult to design a system that can satisfy the vast amount of simultaneous resale transactions. For example, on November 11, 2018, an annual shopping carnival recently popularized by Alibaba, the peak transaction volume reaches 544,000 per second. The OceanBase system of Alibaba can support up to 61 million transactions per second. This is just an example of how large resale transaction volume can be. With further economic growth, urbanization, and digitalization, future transaction volume can be much bigger. Therefore, it is very difficult to construct a single system to support all the transactions.

In addition to the technical difficulty, a single-layer system has two more shortcomings. First, it distracts the central bank from the central mission of monetary policy making. In modern era, central banks have split themselves from daily commercial banking services and specialized in monetary policy making and financial monitoring. A single-layer system will be a major setback on such specialization. This is especially unjustified for a large economy such as China. Second, a single-layer system also exposes the central bank directly to any unknown risks e-CNY may bring. As a brand new and potentially potent instrument, e-CNY may still have unforeseeable bugs and problems. Such bugs and

problems may impose significant risks if spread into the whole monetary system. A double-layer system help eliminate or at least reduce the risks. In case of emergency, a firewall can be set up.⁴

Fourth, e-CNY will not be blockchain based at issuance but is technology-neutral in distribution. With the help of Bitcoins and other cryptocurrencies, the merit of blockchain technology is widely recognized. In the core, blockchain is a Distributed Ledger Technology (DLT) that is decentralized, traceable, and disrewritable. Such a technology can build trust among untrusted parties. Such trust is obtained at the cost of redundant computations and storage, which makes it unsuitable for resale transactions. Therefore, e-CNY cannot be based on blockchains at issuance. It is simply not technically feasible at this stage of technology development. It is also not necessary. Central bank, commercial banks, and other big tech companies within a country are not strangers but creditworthy players in the modern economy. Their credit can be used to replace part of the redundant computing and storage. Regulations can help build and enhance their credit when necessary.

However, when distributing e-CNY into the monetary system, commercial banks and big-tech companies can choose to use any technology, including blockchain technology. This is similar to existing stable coins such as USDT and USDC. It is also similar to Libra, a new stable coin proposed by Facebook. The virtue of such a design is two-fold. First, the central bank can specialize in money

⁴ I am not saying that a firewall is enough to secure the potential risks. The chance is that a

issuance and central data management. Second, it can introduce competition among commercial institutions and promote technological progress. Whichever institution has a better technology can grasp a larger share in this future important market.

03. How does e-CNY compare to other digital instruments?

When people talk about digital payments in China, people usually talk about Ali-pay, We-chat Pay, or cryptocurrencies. e-CNY is a new species in the family. It will be useful to make a comparison to figure out how e-CNY differs from existing digital instruments. There are three important differences between e-CNY and other digital currencies.

First, it is issued by the central bank. Therefore, it is the official currency supported by governmental laws. By law, all residents must accept e-CNY as a legal form of payment when they have the equipment. On October 23, the People's bank of China published the revision plan of *Act of People's Bank of China*. In this revision, digital currency will be officially included in legal forms of payment, together with traditional paper cash and coins. After the revision, people cannot refuse to accept e-CNY as long as they have the facilities.

In comparison, other forms of digital currency, including Ali-pay and We-chat pay, are not official currencies. Therefore, people can choose not to accept Ali-pay or We-chat pay. Strictly speaking, Ali-pay and We-chat pay are not currencies, but

third-party payment facilities that help make the payment process more convenient.

Tech-based cryptocurrencies such as Bitcoin are not issued by the central bank or other government agencies. They are produced by an algorithm operated by an internet community. Since the government cannot control its supply, a cryptocurrency will necessarily compete with the government for the privilege of money issuance. This is why many governments do not welcome tech-based cryptocurrencies. As long as modern social life is still organized around state governments, the space of tech-based cryptocurrencies will be limited. Here I use the term tech-based cryptocurrencies to refer to cryptocurrencies not issued by central banks. Familiar examples include Bitcoin, Litecoin, and Ripple.

e-CNY is also different from Libra proposed by Facebook, which is renamed to Diem in December 2020. Diem has not been issued and is under revising. By design, it is stable coin pegged to a basket of currencies or a single currency such as the US dollar. In this aspect it's similar to other stable coins such as USDT and USDC. Libra (Diem) attract huge amount of attention because it can be distributed via the huge social media network of Facebook. It is estimated that Facebook has 2.4 billion users around the world. The potential influence of Libra (Diem) is beyond imagination. Interestingly, Libra (Diem) encounter some major setbacks possibly because of its potentially huge impact on the existing monetary system.⁵

⁵ On June 18, 2019, Facebook published a white book and proposed a new cryptocurrency called Libra. Initially, Libra is supposed to pegged to a basket of major currencies including US dollar, British pound, Euro, and Japanese Yen. This proposal encountered some setbacks due to lack of support from the US government and European country governments. Some major partners draw back from the project, including Paypal, eBay, Stripe, Mastercard, and Visa. Facebook has been revising Libra's design and positioning ever since. For example, on the second white booked published in April 2020, the nature of Libra is revised from

Second, e-CNY supports offline transactions. In contrast, all other digital currencies and third-party payment instruments require both transaction parties to be online. Offline transactions are supported by Bluetooth and NFC communication technologies. Nowadays most smart phones have these functions. In the future, offline transactions may not account for a large percent of all transactions. However, this function is still necessary because e-CNY is an official currency so it must consider rare scenarios where people do not have internet signals or the signals are of low quality. This is rare but not absent. It should also be noted that offline transactions will probably be limited to small value transactions to provide convenience as well as prevent risks. Finally, although these transactions are offline, the information can still be uploaded and recorded when the internet becomes available.

Third, e-CNY supports semi-anonymity. Transaction parties do not need to know the identity of the counter party. The transaction is secured by the underlying system which verify the transaction and prevent the problem of double spending. This process is similar to paper cash verification using a verification equipment. In contrast, tech-based cryptocurrencies often support total anonymity. In fact, Bitcoin and other encrypted currencies have become popular at least partly because of the total anonymity, although it is possible to detect the real identities of the transaction parties.

“a simple global currency” to “a simple global payment system”. In December 2020, Libra is renamed to Diem. If successfully issued, Diem aims to peg to US dollar rather than a basket of currencies. Would this happened, it will help strengthen US dollar.

Semi-anonymity is quite different from total anonymity: anonymity is only between transaction parties and it is not anonymous for the central bank. Technically, the central bank can trace all transactions and store all the data in their clearing system. Even offline transactions are still recorded in the database. By using this database, all transactions of all parties can be monitored and regulated. It is not clear yet how the data will be used. Ideally, some rules about data accessibility can be set up to protect transaction privacy as well as maximize the value from the data resource. Otherwise, it will be either a tremendous risk, or a tremendous waste.

In short, there are at least three important differences between e-CNY and other digital instruments. First, e-CNY is an official digital currency while others are not. Second, e-CNY supports offline small value transactions. Third, e-CNY supports semi-anonymity. This last feature is quite significant from the regulation perspective.

It is also helpful to compare e-CNY to other countries' CBDC. As we mentioned earlier, many central banks have engaged in research, experimentation, or development of CBDCs, including the Federal Reserve of the United States, the Bank of England, the European Central Bank, the Bank of Japan, the Bank of Canada, etc. The main difference between e-CNY and these CBDCs in discussion is that e-CNY is not based on distributed ledger technology (DLT) or block chain. PBoC explained that DLT cannot satisfy the vast amount of simultaneous retail transactions in China. DLT may be more appropriate in a smaller economy or in particular scenarios.

Among these CBDCs in discussion, the closest to e-CNY is the RScoin proposed by the Bank of England in 2015 (Danezis and Meiklejohn (2015), Broadbent (2016)). RScoin as proposed is also a digital cash operated by the existent double-layer banking system. Interestingly, most CBDCs will adopt a double-layer banking system.

04. What are possible influences of e-CNY?

By now we have a relatively clear idea of what e-CNY looks like. Next, we discuss the possible consequences after e-CNY is introduced. Here is where people's opinions widely diverge. Some people think that since most payments are already online, the influence of e-CNY will be minor. Some people also worry that since Ali-pay and We-chat pay are very convenient and user-friendly, e-CNY may not easily get popularity. In fact, some people doubt the necessity of e-CNY. At the other extreme, some people think e-CNY will bring about radical changes and even help RMB internationalization. Here, my opinion is somewhere in between. I argue that although e-CNY will not have a visible effect in some area, its potential effect in other area are quite significant and potentially unmeasurable. As to RMB internationalization, I would say its short-term effect is probably quite limited.

First, the effect of e-CNY on resale payments can be somewhat limited. This is because digital payments such as Ali-pay and We-chat pay are already prevalent and very convenient. It's not clear why people should switch to e-CNY wallet unless it is at least equally user-friendly. Otherwise, people can continue to use

Ali-pay and We-chat pay. Since e-CNY is designed to replace M0 and people rarely use cash, these people do not even need to know the replacement of cash with e-CNY.

Second, e-CNY may have significant effects on financial monitoring and economic policy implementation. This is because all transactions can be traced and recorded in PBoC's data base. Such a database can be very useful in many areas, such as anti-corruption, anti-money laundry, and anti-tax evasion.

For example, e-CNY may help anti-corruption. It can be required that all public servants must use e-CNY in all their everyday life transactions as an anti-corruption measure. Such a requirement can help popularize e-CNY and improve user friendliness. As another example, e-CNY can be used in subsidy distribution. It often happens that subsidies to particular groups, such as poor and old people, are redirected to other usage or delayed for a long time. With e-CNY, such subsidies can be directly issued to targeted people. After-payment flow of the money can also be monitored and analyzed. This also means that possible corruption and fake accounts can be identified. With such a database, future monetary and fiscal policies and can be better monitored and their effectiveness can be improved.

Third, the effect of e-CNY on RMB internationalization will be quite minor, at least in the near future. RMB internationalization depends on RMB's acceptability in the international community, especially among neighboring countries and trade

partners. e-CNY can help facilitate RMB when it is willing accepted. Before that, its role in RMB internationalization is limited.

History tells us that people's acceptability of a new international currency is very slow. For example, the United States is already the world's largest economy around 1870. However, USD did not replace Britain Pound as the leading international currency until 1945. There is a 75 years gap in between. Right now, China's GDP is only about 2/3 of that of the United States. Even after China becomes the largest economy, there is still a very long way to go before RMB can become a top international currency. Right now, it is unclear what the future international monetary system will look like. The author speculates that USD will continue to dominate the international monetary system and serve as the anchor of international economy for a very long time. The best RMB can expect is to become a second-tier primary currency, similar to Euro, Pound, and Japanese Yen. In the short run, gradual acceptance in neighboring economies and trading partners is a reasonable expectation. This can help China's international trade, especially export companies.

05. Summary

In this chapter we introduce China's development of central bank digital currency (CBDC). Since China's CBDC has not been officially launched, we compile a relatively clear picture of what it will look like from publicly available information. We also compare it with other digital instruments and discuss its potential influences.

The official name of China's CBDC is e-CNY. It is digital cash designed to replace traditional paper cash and coins (M0). It is currently at the stage of contained experiments in selected areas. It will be distributed into the monetary system via a double-layer system with the central bank as the root and commercial banks and big-tech companies as the tree. It is not blockchain based at issuance but is technology neutral in distribution. Commercial banks and technology companies will play a major role in developing and operating the infrastructure and managing money accounts.

People have been debating about the relationship between e-CNY and existing digital payment facilities. They are not competitors but vertical cooperators in monetary services. After the introduction of e-CNY, existing payment facilities can peg to e-CNY as they peg to traditional money. People can choose not to switch to e-CNY. e-CNY can also compete for a market share in electronic payment.

Overall, e-CNY may have a significant effect on domestic financial monitoring such as anti-corruption, anti-tax evasion, anti-money laundry. It also effectively affects monetary policy. Since future banking system will evolve accordingly, this influence is gradual but can be very profound. When all data are available in one large data set, whoever has access to the data and can analyze the data are potential bankers. The future banking industry may be split into saving institutions, payment facilities, and loan institutions. At this stage, it is different

to foresee how profound the changes can be and how fast these changes will happen.

The effect of e-CNY on RMB internationalization is likely to be limited in the near future before RMB is much better accepted in the international community. e-CNY can help RMB internationalization after it's better accepted internationally, but not vice versa.

References

Böhme, R., Christin, N., Edelman, B., & Moore, T., "Bitcoin: Economics, technology, and governance.", 2015, *Journal of Economic Perspectives*, 29(2), 213-38.

Broadbent, B., "Central banks and digital currencies." 2016, speech at the London School of Economics, 2.

Danezis, G., & Meiklejohn, S. , "Centrally banked cryptocurrencies". 2015, arXiv preprint arXiv:1505.06895.

Fan, Yifei, Several considerations about central bank digital currencies, *China Business Network*, 2018-01-26.

Fan, Yifei, About the policy implications of e-CNY's role as M0, *Financial Times*, 2020-01-26.

Fan, Yifei, Several opinions on digitalization of the payment service industry, speeches on the Ninth China payment and clearing forum, 2020-09-24.

Libra Association Members, An Introduction to Libra, White Paper, 2019.

Libra Association Members, The Libra White Paper v2.0, 2020.

Mu Changchun, Fintech frontier: Libra and outlook for digital currencies, *Dedao APP*, 2019.

Working Group on E-CNY Research and Development of the People's Bank of China, Progress of Research & Development of E-CNY in China, July, 2021.

Yao, Qian, Experimental Study on Prototype System of Central Bank Digital Currency, *Journal of Software*, 2018, 29(9): 2716–2732.

Yao, Qian, “Central Bank Digital Currency: optimization of the currency system and its issuance design.” *China Economic Journal*, 2019, 12(1), 1-15.

Yermack, D., "Is Bitcoin a real currency? An economic appraisal." *Handbook of Digital Currency*. Academic Press, 2015. 31-43.