

Blockchain Technology and Commercial Bank Cryptocurrencies

Cryptocurrencies are the new form of money in today's monetary and financial markets. They reveal new IT, distributed ledger, and blockchain technologies, which will change the structure of international financial markets. Distributed ledger technology (DLT) is a database architecture that enables the storing and sharing of records in a distributed and decentralized pattern. It sustains the integrity of the data by using digital validation protocols and cryptographic keys. Based on the DLT, global banks are issuing digital currencies, which are primarily used in blockchain settlements in financial markets. Unlike decentralized bitcoin, these bank-issued cryptocurrencies are digital tokens backed by reserve currencies, such as the US dollar or Japanese yen. This kind of cryptocurrency could be referred to as "commercial bank cryptocurrency." JP Morgan is the first to issue this kind of cryptocurrency. However, other big banks in both Europe and Japan are launching or planning such digital currencies. This study focuses on what these commercial bank cryptocurrencies will contribute to financial markets and how these digital currencies will change the monetary system in the future.

Keywords: *cryptocurrency, commercial bank cryptocurrency, blockchain technology, distributed payment systems*

Introduction

Although bitcoin, the first cryptocurrency, was introduced in 2009, it only caught the attention of the mainstream media in 2012. Due to its anonymity, some scholars often compare bitcoin and other cryptocurrencies with cash. However, unlike cash, these cryptocurrencies are purely digitalized and used only in online systems and may compete with other online payment methods. Cryptocurrencies may have a substantial long-term effect on both payment and financial systems (Gandal & Halaburda, 2014).

Since there are ongoing discussions on bitcoin and its technologies in both mainstream media and academic, global banks have started to work on these new technologies. Their efforts are focused on cash payments and clearing and settlement of financial assets using cryptocurrencies, which are directly convertible to local currency, rather than waiting for traditional money transfer transactions. This will reduce the time, cost, and capital required in post-trade clearing and settlement in financial markets, especially in cross-border transactions. These cryptocurrencies issued by private banks, which are convertible to different national currencies, will be stored in digital wallets, using DLT; this will ensure a quick and instant payment and settlement of financial assets that are traded by these banks and their clients (Arnold M, 2017). These cryptocurrencies issued by private banks could be referred to as commercial bank cryptocurrencies. A commercial bank cryptocurrency is a

digital currency that is issued by a private bank and based on blockchain and DLT.

This study focuses on a new type of money, a private money, which is not paper banknotes but in crypted digital form, issued by commercial banks instead of central banks. First, it presents a summary of blockchain and DLT.

The Concept of Commercial Bank Cryptocurrency

Blockchain and Distributed Ledger

Distributed ledger is a software technology that is based on protocols and their related infrastructure. This digital technology allows different computers to validate and execute digital transactions across a network. This structure also updates the digital records on the network in a synchronized way and in real time (Bech & Rodney, 2017). The digital data is stored and maintained in a single location and is controlled by a central administrator in a centralized database technology. There is also a security code that protects the database from cyber-attacks. However, the distributed database is spread across a network and stored at different physical locations. Although the database is shared across the network, a central administrator controls the data. A centralized software is used to manage the database. The network nodes are in the security perimeter, and access is controlled by a network administrator (Benos, Rodney, & Gurrola-Perez, 2017).

The distributed ledger concept is not new. Such ledgers were used and are still used by firms, such as retailer shops, that have branches across a city, a region, or different countries. However, in a conventional distributed ledger, the role of the system administrator is key to maintaining consistency across the multiple copies of the ledger. The system administrator can ensure consistency in the system by maintaining a master copy of the ledger, updating it periodically, and sharing with all parties in the network (Bech & Rodney, 2017).

Cryptocurrencies that are based on DLT are designed to function without a central administrator. In such a system, each transaction is conducted in a peer-to-peer manner and sends the data in batches (also known as blocks) to all participants that work on validating the transactions. This type of DLT is called blockchain technology since the ledger is organized as separate but interlinked blocks. In recent years, the blockchain version of DLT has enabled bitcoin and other cryptocurrencies' transactions. This system has some features that are not desirable in a financial transaction:

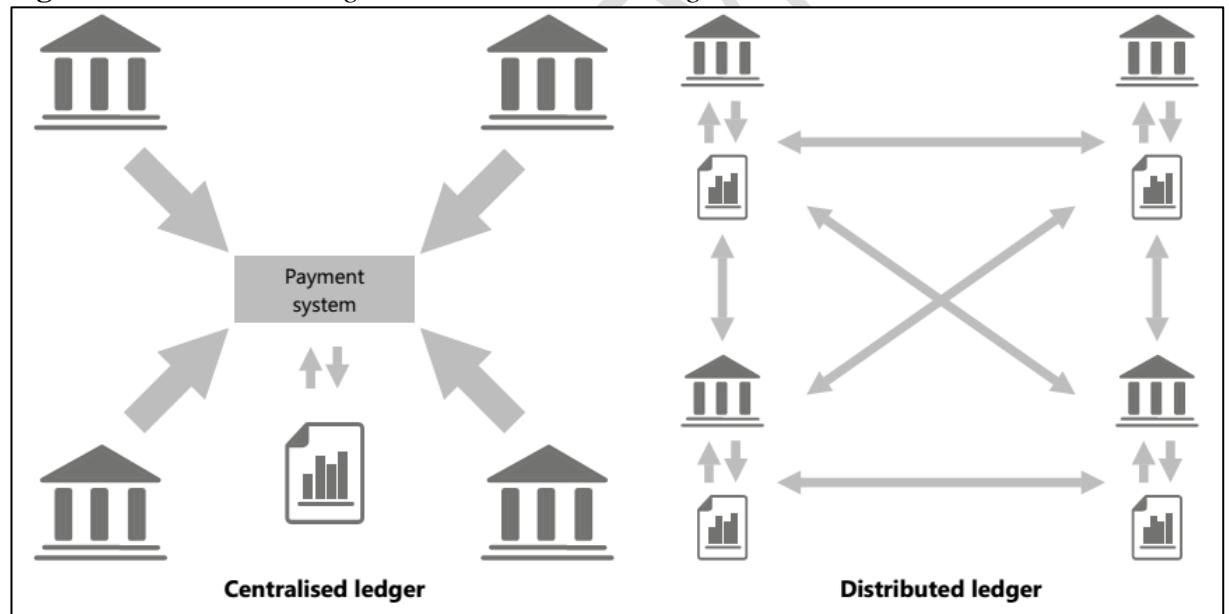
- (i) The infrastructure is expensive to operate since the system requires large amounts of computing power to complete each transaction;
- (ii) The settlement of the transactions may not necessarily end in a conventional bank settlement;
- (iii) The transactions are open to the participants in the network.

Due to these drawbacks, banks' cryptocurrencies have abandoned the standard blockchain technology (Bech & Rodney, 2017).

In local financial markets, national currency payment systems are based on "centralized ledger system," such as *Elektronik Fon Transferi* (EFT) system operated by the Turkish Central Bank. All bank payments in Turkish lira are recorded in the Central Bank's digital ledger (Figure 1).

DLT has great potential in the financial sector to create a new system for clearing and settlement, as well as transferring and storing information about the ownership of financial assets and cash deposits. It can be used in payment systems and ensure a secured clearing and settlement of transactions, including cross-border payments and settlements (Mills & Wang, 2016). Leading international institutions and public entities in the financial sector, such as Bank for International Settlements (BIS), International Monetary Fund (IMF), the US Federal Reserve Bank, and the European Central Bank, are working on digital systems that are based on DLT and blockchain technology.

Figure 1. Centralized Ledger versus Distributed Ledger



Source: Bech & Rodney (2017)

The Digital Chain of Money

Since the collapse of the Bretton Wood system, many national currencies are just an entry in a ledger. These national currencies are circulated by the central banks as monetary reserves or by commercial banks when they extend credits. They are electronic databases in the global financial system. A fiat currency is not a real commodity but a promise to pay. In the modern world, financial transactions are just adjustments to the ledgers of central banks, banks, firms, and individuals to reflect changes in these promises to pay.

Therefore, national currencies are digitalized and continuously swapped between electronic ledgers across financial markets.

Just like a national currency, a cryptocurrency is only an entry in an electronic ledger. However, unlike any local currency, each cryptocurrency is uniquely represented by cryptographically generated digital keys. A cryptocurrency is transferred from one entity to another by recording it in a different account in the ledger. Transferring a cryptocurrency is definite and irrevocable just like exchanging banknotes since each currency is a uniquely identifiable digital token with a crypted key. Therefore, money in the form of a cryptocurrency is like fiat money on a digitalized fiat monetary system. Since blockchain technology is used in these cryptocurrencies, they cannot be counterfeited. Like banknotes with serial numbers, cryptocurrencies with crypted keys can easily be monitored by legal authorities. Blockchain technology makes it possible to track the records of each transaction of each cryptocurrency (Arnold M, 2017).

In the modern financial system, many financial institutions issue financial instruments based on deposits; the owners of these instruments perceive them as assets and use for payments. Each financial institution issues its financial instruments, and when each party holds their monetary instruments at a different institution, each payment from one party to another involves a specific change of amount in the account ledger of each party. DLT can easily be used to establish a common ledger for each institution. However, if more than two institutions are involved in the payment transfer, a different approach will be needed to settle the payments. Each bank settles its payment by adjusting its claims on the other or settles it through claims, a corresponding bank, or a central bank. It is also possible to design monetary instruments that parallel some of the original properties of banknotes (Mills & Kathy, 2016).

In a distributed ledger system, each financial institution maintains its ledger for its customers to make direct payments between one another without sending payment instructions through the financial institution. The assets issued by this financial institution that are recorded in the distributed ledger can be registered in the name of each customer or issued in a bearer form and owned by the buyer. When multiple financial institutions are involved in the transaction and have customers who want to make payments across the financial system, a multilateral transfer system is used to clear and settle cash and securities transactions between these institutions (Mills & Kathy, 2016).

Commercial Bank Cryptocurrency

During the 19th and at the beginning of the 20th centuries, the term “commercial bank money” was used to refer to the banknotes issued by commercial banks and backed by the banks’ deposits in national currencies, which are at that time were gold and silver coins. In today's financial system, commercial bank money refers to the portion of the money supply that is made of debts created by commercial banks. It is a derivative of “central bank money,” the only legal tender issued by a central bank of a national economy.

Table 1. Similarities between Private Banknotes and Commercial Bank Cryptocurrencies

Private Banknotes	Commercial Bank Cryptocurrencies
Issued by private banks	Issued by private banks
Backed by cash (gold and silver coins)	Backed by cash (paper money) and financial assets
Used both in local and international markets	Used in international markets
Intensively used by banks and firms	Intensively used by global banks and their clients

In today's financial system, post-trade business involves the clearing and settlement of financial assets transactions traded in financial markets. Commercial bank money refers to the cash used by commercial clearing firms, such as Euroclear, Clearstream, or any bank that issues traded securities, in the clearing and settlement process. Government securities and money market transactions in local currencies are mainly settled at the central banks, using central bank money. However, the commercial securities issued by private companies or international financial assets, such as eurobonds, are cleared and settled by commercial entities, such as central counterparties and global banks. These are complicated and costly post-trade transactions commenced by professionals in the global banking sector. Modern commercial bank money is created by using a fractional reserve mechanism to issue loans whose value are many times more than that of the actual national currency of the banks. Moreover, this commercial bank money is mainly used in post-trade cash settlement in financial markets. Today, this type of commercial bank money, in the same amount as the national currency deposited at the bank, has evolved into a new digitalized commercial bank cryptocurrency.

There are certain differences between commercial bank cryptocurrency and other anonymous cryptocurrencies:

- i. Commercial bank cryptocurrencies are backed by financial assets issued by commercial or public entities and backed by cross-border local currency transactions of these assets.
- ii. Commercial bank cryptocurrencies are commercial bank money issued and guaranteed by global banks, not by some anonymous persons or IT companies.
- iii. Commercial bank cryptocurrencies could easily be accepted by major central banks and may become, to a certain degree, cross-border legal tenders that are convertible to local currencies.

JPM Coin by JP Morgan

The first example of such a commercial bank cryptocurrency is the JPM coin developed by JP Morgan, a global American bank. The bank is preparing a cryptocurrency for cross-border payments and corporate debt issuance. It will be one of the first real commercial bank cryptocurrency in the global banking system. Unlike bitcoin, only big institutional clients of JP Morgan, such as corporations, banks, and broker-dealers, can use this cryptocurrency (CNBC

2019). Each JPM coin is redeemable for a single US dollar, so its value does not fluctuate. The coins would be issued to JP Morgan's clients after they deposit dollars at the bank; after the tokens have been issued for a payment or security transaction on the blockchain, the bank gets the cryptocurrency and gives a commensurate number of dollars to the bearer (CNBC 2019).

There are three early applications of JPM Coin (CNBC 2019):

- i. The first is for international payments of large corporate clients of J.P. Morgan, which is currently done through wire transfer systems between financial institutions on networks, such as SWIFT.
- ii. The second is for securities transactions. Rather than using wires to buy or sell securities, institutional investors can use the JPM coin, resulting in instant settlements.
- iii. Finally, huge corporations that use JP Morgan's treasury services business will use it to replace the dollars they hold in subsidiaries worldwide.

The Utility Settlement Coin (USC)

USC was conceived as a research project in 2015. A consortium of banks wanted to explore the endless possibilities of the tokenized world of DLT and blockchain technology and understand the potential impact on the world. Since 2015, the consortium expanded to 16 institutions: Barclays, BNY Mellon, CIBC, Commerzbank, Credit Suisse, Deutsche Bank, HSBC, ING, KBC, MUFG, Santander, SMBC, State Street, UBS, Wells Fargo, and CME/NEX. Moreover, 12 of these banks are part of the global systemically important banks (G-SIBs), which are the 30 most important banks in the world. However, this was just the beginning. In May 2019, the USC consortium members took the next step by investing in Finality International (Finality), which was established to deliver the USC promise. The objective is to create a peer to peer digital cash asset to settle tokenized value transactions with finality. It would be available in multiple currencies and work across platforms. The settlement asset would be a digital unit that represents a claim on collateral, which would be in the form of fiat cash, held with the central bank. It would have the right to ensure that in each jurisdiction, the settlement is considered final and cannot be reversed by the local courts. The consortium members sponsored the USC project to explore the way forward. Several high-level goals were set for the project since it was viewed as a step towards a potential strategic investment. Some of the goals are to have a level of comfort that Central Banks will support, to have a technology that would work, and to make it possible for the banks to integrate the proposed new platform into their system. After the strategic investment round, Finality continued the project and introduced USC (Finality, 2019).

The USC would be used among global banks for in the international financial market, and it would enable global banks to repay each other in different currencies without using the current cross-border settlement

infrastructure. Then the next step will make securities settlement transactions with the USC possible (De Meijer, 2017).

J-Coin by Japanese Mizuho Bank

With the support of sixty regional banks in Japan, the Japanese Mizuho Bank launched a digital currency in March 2019. Mizuho Financial Group was supported by the Central Bank and financial regulatory authority of Japan. It was named J-Coin, which probably means Japan Coin. J-Coin is an electronic currency that is used to pay for goods and transfer money using smartphones. J-Coin users would download an application on their smartphone. Payments are made using QR codes. The value of the digital currency would be fixed at 1 J-Coin equals 1 Japanese yen. J-Coin is also a stable coin (Finextra, 2019).

J-Coin users can transfer funds to other accounts, not only other Mizuho Bank accounts but to deposit accounts at any financial institution that is part of the J-Coin infrastructure. Moreover, J-Coin users can use it to make payments in markets and shops. Foreign customers visiting Japan can also use J-Coin “through partnerships with QR code operators outside Japan” (Mizuho Bank, 2019).

MUFG Coin by Japanese Mitsubishi UFJ Financial Group

Mizuho is not the only Japanese bank that is working on a private cryptocurrency. Mitsubishi UFJ Financial Group is also planning trials of its MUFG Coin, which has about a hundred thousand account holders in Tokyo. Just like the J-Coin, MUFG Coin has a 1:1 fixed exchange with the Japanese yen. Users can download it on their smartphones and use it for peer to peer cash transfers and online shopping (Finextra, 2019).

There are two main features of these commercial bank cryptocurrencies:

- i. They are only used by the clients of the issuing bank.
- ii. They are pegged at 1:1 to their national currencies (US dollar or Japanese yen).

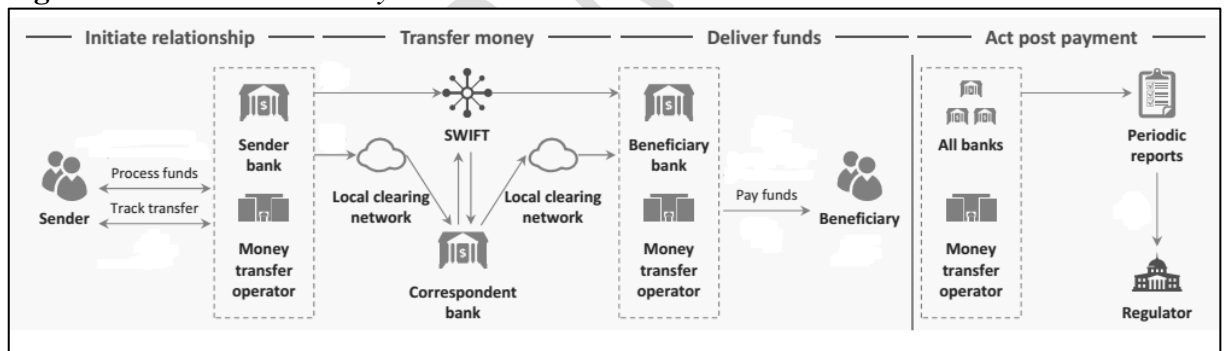
Some of the world’s leading banks have launched or are about to launch their cryptocurrencies. The advantages and disadvantages of commercial bank cryptocurrency in the financial sector should also be discussed. Thus, the next section presents the strengths, weaknesses, opportunities, and threats (SWOT) analysis of commercial bank cryptocurrencies’ transactions to uncover strategies to leverage the strengths and opportunities, mitigate the weaknesses, and overcome the threats.

SWOT Analysis

The Advantages of Using Commercial Bank Cryptocurrencies in Financial Transactions: Strength and Opportunities

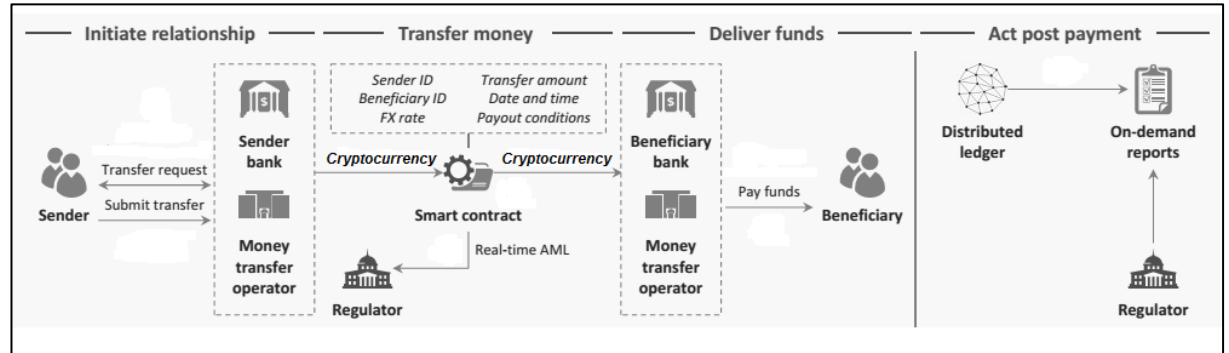
Corresponding banks usually intermediate the international transfer of funds. Through correspondent banking relationships, banks agree to provide payment services to each other, access financial services in different jurisdictions, and provide cross-border payment services to their customers. The current global payment process is highly dependent on the SWIFT system and local cash clearing systems developed by central banks and commercial banks. A money sender in a country uses the interface of his or her bank's money transfer system or local money transfer operator's system, such as PayPal or Moneygram, which uses local clearing networks. The system manually or automatically changes the message to a SWIFT message and send it to the corresponding bank of the sender's bank of the specified currency, such as the US dollar or euro. The beneficiary bank in the other country gets a SWIFT message from the corresponding bank and credits the beneficiary's account. The banks periodically report all transactions they have executed to local regulators (Figure 2).

Figure 2. Current Global Payment Process



Commercial bank cryptocurrencies will make both international and local funds transfers much easier than using the conventional way. The currency conversion at the sender and beneficiary banks would be facilitated through a smart contract. Regulatory authorities can monitor transactions in real time and receive specific anti-money laundering alerts through the smart contract. Commercial bank cryptocurrencies would be used to execute the real-time transfer of funds with minimal fees and ensure a guaranteed delivery without the need for a correspondent bank. Funds would automatically be deposited into the beneficiary account or made available for pickup after customer verification. The transaction history would be available in the distributed ledger and continuously reviewed by regulators (Figure 3).

Figure 3. *Future Global Payments Process Using Commercial Bank Cryptocurrency*



One important effect of commercial bank cryptocurrencies is the cost of fund transfers. The costs of sending international remittances are very high. As of 2015, the global average cost of sending small remittances, such as 200 US dollars was 7.7%; it had declined from just below 10 percent in 2008. In contrast, the cost of transferring bitcoin is approximately 1% by 2015 (He et.al, 2016).

The Disadvantages of Using Commercial Bank Cryptocurrencies in Financial Transactions: Weaknesses and Threats

Commercial bank cryptocurrencies will reduce cross-border transactions and increase the volume of international payments. However, when the in-border transactions in local markets are considered, cryptocurrencies may have few advantages over national currencies. Since there are existing digital payment systems in national currencies in many developed and developing countries, individual customers and firms may continue to use national currencies to make payments in their national market.

Another challenge is customers' trust in private money. In every country, economic agents use their sovereign currency to pay for their commercial transactions. It may be difficult for them to adopt private currencies in any form. Moreover, since central banks are also planning to issue cryptocurrencies, these "national cryptocurrencies" may easily replace the commercial bank cryptocurrencies. Many governments may also try to restrict the use of private cryptocurrencies to favor their national cryptocurrencies issued by the central banks since commercial banks were banned from issuing private banknotes in the last century.

1 **Table 2. SWOT Analysis of Commercial Bank Cryptocurrencies**

Strengths	Weaknesses
Fast and low-cost money transfer, especially in cross-border transactions	Limited only to customers of the commercial banks involved
Increase cross-border transactions	Not trusted like national currencies
1:1 backed by national currencies	Local use in national borders has no advantage over national currencies
High tech	Not self-proven technology
Opportunities	Threats
Reduced costs would increase international finance and trade	Central bank cryptocurrencies may dominate the market in the future
Increase international capital flow	Strict government regulations
More effective KYC (Know Your Customer) process	A fully digital currency system is open to cyber attacks
More efficient public audit	

2

3

4 **Future of Commercial Bank Cryptocurrencies**

5

6 *“Imagine a financial system with a single, universal, absolutely trustworthy and*
7 *completely indestructible ledger. One master list to record everything having to do*
8 *with money, all over the world.”*

9

UBS Group Technology White Paper

10

11 JP Morgan Coin would be an important turning point in the cryptocurrency
12 business and could easily become commercial bank money just like the
13 commercial banknotes backed by gold and silver coins that were issued by
14 private banks in the era of gold standard during the end of 19th and at the
15 beginning of the 20th centuries. Since at that time, the legal tenders of big
16 economies were gold and silver coins, banknotes were just “notes” that
17 resemble legal commodity money that earns interest. The commercial banknotes
18 replaced the commodity money after the first world war. Similarly, commercial
19 bank cryptocurrencies may easily replace central bank banknotes in the coming
20 decades. For example, if commercial bank cryptocurrencies are accepted as
21 legal tender by governments in developed economies, such commercial bank
22 cryptocurrencies may widely spread across financial markets worldwide.
23 Currently, the world is in a new frontier in the financial system: a financial
24 system that is based on blockchain technology. In today’s financial system,
25 being a big bank is good for many aspects of financial businesses. Big financial
26 institutions take advantage of economies of scale to provide more cost-
27 effective services to their customers. Having large-scale banking services with
28 a huge capital helps to foster trust. Economic agents perceive large banks to be
29 serious, competent, and solid. In a blockchain-enabled financial sector, these
30 strengths of big banks may be turned on its head. If costumers’ trust is shifted
31 from big banks to the blockchains of small companies; then large, expensive,
32 highly capitalized financial firms would not be needed to enforce it. Since
33 centralized systems are more expensive then private ones, that would also be a

disadvantage. Thus, this technology will also reduce the market entry barrier of new firms. (Batlin, Jaffrey, Murphy, Przewloka, & Williams, 2016).

Could commercial bank cryptocurrencies replace reserve currencies in the distant future? Just as commercial banknotes replaced gold and silver coins, commercial bank cryptocurrencies may easily replace central bank banknotes in the coming decades. These cryptocurrencies can become the first commercial bank crypto-banknotes backed by cash and assets just like commercial banknotes issued by private banks during the end of 19th and at the beginning of the 20th centuries were backed by gold and silvers coins.

If the transformation process from commodity money to commercial banknotes to central bank banknotes were the same, then the pattern for cryptocurrencies would be the same. This would involve these stages. First, there would be widespread use of commercial bank cryptocurrencies by firms and individuals. Second, both commercial bank cryptocurrencies and central bank banknotes would be used as legal tenders at the same time. Third, central banks would start issuing “central bank cryptocurrencies.” Lastly, only central bank cryptocurrencies would become the legal tender, and central banks’ paper money would become an ancient relic.

However, there are some questions about the possible future scenarios of commercial bank cryptocurrencies in the international payment system. First, is it possible that all global banks would use commercial bank cryptocurrencies to settle their international transactions in the global financial markets in the coming 20 years due to its low cost and easy operations? Second, would the major central banks, such as the US Federal Reserve, European Central Bank, Bank of England, and Bank of Japan, also use these commercial bank currencies? Third, are the central banks worldwide ready to use these cryptocurrencies intensively, and are they ready to issue their cryptocurrencies? If in the coming years, the answers to these three questions are yes, cryptocurrencies will become the “next generation money” and end the paper fiat money era (Table 2).

One of the key concerns is whether central banks may stop supplying a governmental guarantee to payments in the financial system. Another concern is whether the retail payment infrastructure system could be transformed into a purely privately owned business. Governments should not entirely withdraw their social responsibility in the financial system. However, the exact role of governments and central banks would be seen in the future (Ingves, 2018).

Table 2. Possible Evolutionary Steps of Commercial Bank Cryptocurrencies

First stage	Global banks will use for international financial transactions
Second stage	Firms and individuals will use for international financial transactions
Third stage	Firms and individuals will use in local markets.
Fourth stage	Both commercial bank cryptocurrencies and central bank banknotes would be used as legal tender at the same time.
Fifth stage	Central banks will issue central bank cryptocurrencies
Sixth stage	Only central bank cryptocurrencies would become the legal tender, and central bank paper money would become an ancient relic. Private cryptocurrencies would be no more.

Conclusion

The story of money begun in the pre-historic era as barter transactions of commodities. Then, this barter system evolved into a precious metal monetary system and continued for nearly 3000 years. In modern times, financial institutions have replaced precious metal coins with paper banknotes. Currently, the world is on the edge of a new monetary era: an era of a non-physical, crypted, digital monetary system. This may be the third evolutionary monetary system in human history. This study discusses the contribution of blockchain technology to the monetary and payment system of commercial bank cryptocurrencies. It also discusses the similarities between commercial bank cryptocurrencies and commercial bank paper banknotes, and the effects of commercial bank cryptocurrencies as a means of exchange in the modern monetary system. Moreover, the evolutionary steps of commercial bank cryptocurrencies were presented by comparing them with commercial banknotes.

In the future, there would be a technological revolution in financial markets. Global commercial bank cryptocurrencies will change the entire cash payments and financial clearing and settlement process. This new application of IT technology could easily lead to a dramatic change in the next 20 years. This change would be similar to the changes caused by the internet and communication technologies in the past two decades. Just as cell phones have made desktop phones nearly useless, cryptocurrencies may also make a similar thing happen to printed paper currencies. The use of commercial bank cryptocurrencies may have four main phases in the coming decades: (i) in international financial market payments for both cash and securities, (ii) in international trade, (iii) in local markets by local firms, and (iv) in individual payments. These commercial bank cryptocurrencies would become the next generation money of the rapidly developing economies.

Future research can discuss the theoretical framework of commercial bank cryptocurrencies based on monetary theory and the parity conditions in the market. Moreover, how these cryptocurrencies could be traded against national currencies in the market can be discussed.

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