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What Will Be the Impact of Fintech on the Payment System? A Perspective from Money Creation

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What will be the impact of fintech on the payment system? A perspective from money creation

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Abstract

The efficiency of the current payment system rests not only on engineering technology but also on the legal tender and central bank system enacted by each country's law. This essay compares the current payment system with an alternative payment system that uses electronic records, such as cryptocurrencies and security tokens, as substitutes for conventional currencies. The alternative payment system has an advantage in designing the integration of electronic payments into non-bank businesses from scratch without being bound by the technical specifications of existing bank deposit account systems. On the other hand, it cannot benefit from the supply of legal tender issued by the central bank. Given this disadvantage, this essay argues that electronic records such as cryptocurrencies and security tokens will not substitute conventional currencies spontaneously. Rather than changing the internal structure of the banking system, fintech will facilitate connections between bank deposit account systems and non-banking systems. Given this outlook, this essay predicts that central-bank digital currency (CBDC) will be a kind of enabler service if implemented in a country with a developed banking system.

Keywords: payment systems, security tokens, cryptocurrencies, electronic money, legal tender, central-bank digital currency.

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1. Introduction

The spread of the Internet since the mid-1990s has created an irreversible change in the social circumstance where the Internet constantly connects a large number of people to a single network across national borders. Despite this historical change, the standard form of the current payment system, consisting of a central bank and commercial banks, has been unchanged in each country. It remains a question how new engineering technologies related to the financial industry, commonly referred to as "fintech," will change the payment system.

A well-known example of payment-related fintech is a blockchain, which can record transaction history in a form that is difficult to tamper with. Based on this technology, bitcoin was launched on the Internet as a peer-to-peer network that records balance-transfer history without a central administrator. Subsequently, peer-to-peer networks that use blockchains were collectively known as cryptocurrencies. These cryptocurrencies include so-called stablecoins, designed to maintain a stable exchange ratio with a conventional currency. Analogous to stablecoins, there is also an idea to record the ownerships of traditional assets, such as real estate properties and securities, on a blockchain and to trade the records on the blockchain (so-called security tokens) on behalf of recorded assets.

According to standard economic theory, an easily transferrable asset can circulate as a medium of exchange in an economy. However, this essay argues that the ease of transfer alone will not make cryptocurrencies or security tokens a new medium of exchange. The efficiency of the current payment system is not solely due to engineering technology that enables swift electronic bank transfers. It also rests on the presence of legal tender issued by the central bank, enacted by each country's law. From this perspective, this essay argues that fintech will mainly facilitate connections between banking and non-banking systems. It will not change the internal structure of the banking system consisting of a central bank and commercial banks. Finally, this essay discusses what form central-bank digital currency will take if implemented in a developed country.

2. Money creation in the current payment system

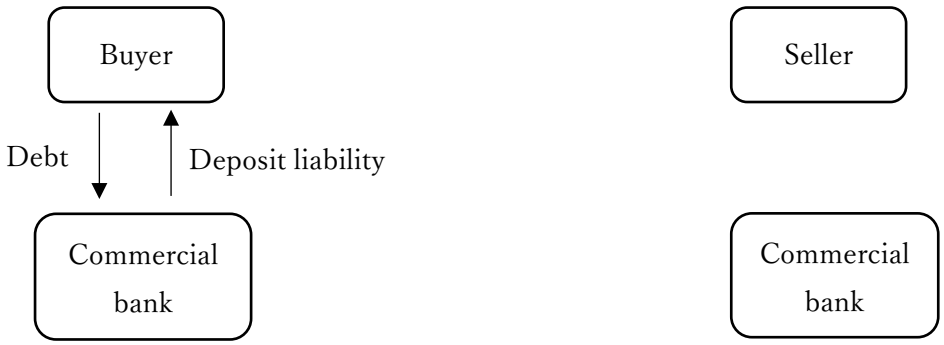
In preparation for the discussion in this essay, let us begin with a brief overview of money

creation in the current payment system.[2]

The typical explanation of banking in a standard economics textbook is that banks receive money from depositors and then lend out the deposited money to some borrowers. In contrast, actual commercial banks directly increase the balances in borrowers' deposit accounts upon bank lending. Since a deposit balance is a commercial bank's debt liability, bank lending is an exchange of a bank's debt liability for the borrower's debt liability (Figure 1).[3]

Figure 1: Money creation in the current payment system

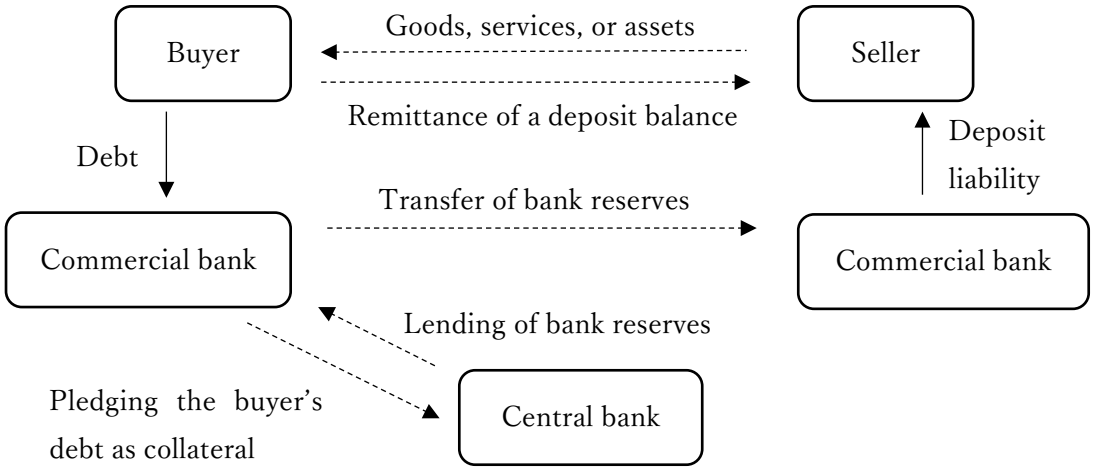
i. Debt exchange upon bank lending



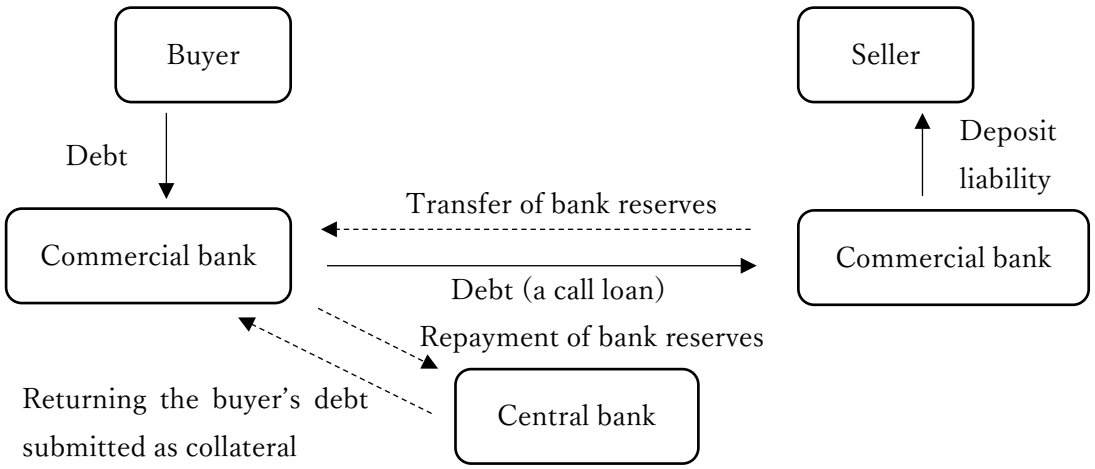
[2] For a more detailed description of money creation in the current payment system, see McLeay et al. (2014). There have also been practitioners and academics explaining it accurately in Japanese, including Yokoyama (1977), Yoshida (2002), Ikeo (2010), Fujiki (2016), and Hayakawa (2022).

[3] For simplicity, Figure 1 assumes that the buyer (borrower) holds a deposit account at the bank lending a deposit balance to the borrower. If the borrower holds an account at a different bank, then the lending bank must send bank reserves to the borrower's bank to send a deposit balance to the borrower. These bank reserves can be temporarily borrowed from the central bank and then returned to the central bank by arranging interbank call loans of bank reserves, as described below. Through these transactions, the borrower and the borrower's bank exchange debt between each other indirectly through the interbank network: the borrower owes debt to the lending bank, which in turn owes debt to the borrower's bank, whereas the borrower's bank owes a deposit liability to the borrower. All the analysis described below holds even in this case.

ii. Settlement of a commercial or asset transaction by a bank transfer



iii. Repayment of bank reserves to the central bank with the arrangement of an interbank call loan



Note: Dotted lines indicate flows of transactions; solid lines indicate outstanding liabilities.

The borrower then pays for his/her purchase of goods, services, or assets by remitting the borrowed deposit balance to the seller. To settle this remittance, the borrower's bank must send bank reserves (i.e., a current account balance of cash at the central bank) to the seller's bank (Panel ii of Figure 1). Commercial banks can obtain these bank reserves by borrowing from the central bank on liquid safe securities pledged as collateral, such as government bonds. Alternatively, they can sell those securities to the central bank for bank reserves. Panel ii of Figure 1 illustrates the former case, assuming that the buyer's debt is acceptable for the central

bank as collateral.

Commercial banks borrowing bank reserves from the central bank must repay the borrowing. Suppose some banks do not have bank reserves to repay to the central bank because they send more bank transfers to other banks than they receive from other banks. In this case, there must be banks that receive more bank transfers than they send on the flip side. Therefore, a bank borrowing from the central bank can always repay the borrowing by refinancing bank reserves from other banks unless it has a high default risk. After all, these interbank transactions establish a credit chain from a seller to a borrower (buyer) indirectly through commercial banks, as shown in Panel iii of Figure 1.

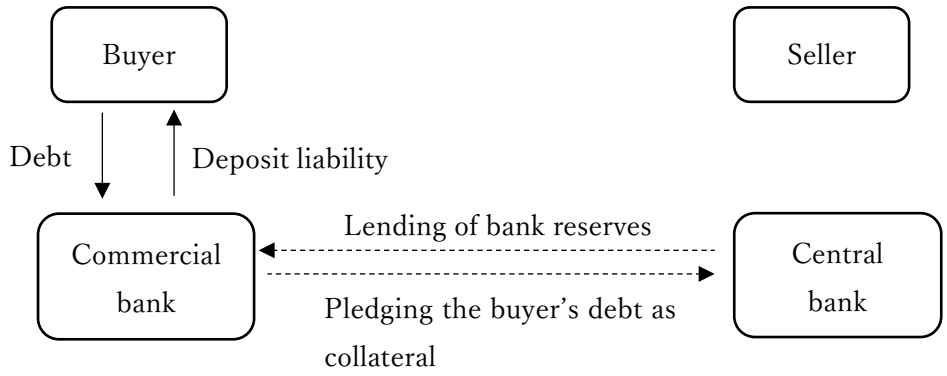
By the way, the borrower in Figure 1 may withdraw the borrowed deposit balance and pay cash (coins and banknotes) to the seller rather than sending a bank transfer. In this case, the borrower's bank can convert a portion of its bank reserves into cash at the central bank and disburse cash to the borrower through its branches or ATMs. Thus, in the modern banking system, bank reserves are first issued in exchange for securities rather than cash. This feature of bank reserves differs from the legal status of bank reserves as "a balance of cash on deposit with the central bank." This discrepancy may be partly why traditional economics textbooks have tended to be inaccurate about money creation in the modern banking system.[4]

If the seller deposits cash into his/her deposit account, the seller's bank can exchange the deposited cash for bank reserves at the central bank. Thus, this case ends up the same as Panel ii of Figure 1, except that cash moves between commercial banks instead of bank reserves. If the seller keeps cash on hand, a credit chain is established from the seller to the borrower via the central bank and a commercial bank, as shown in Figure 2.

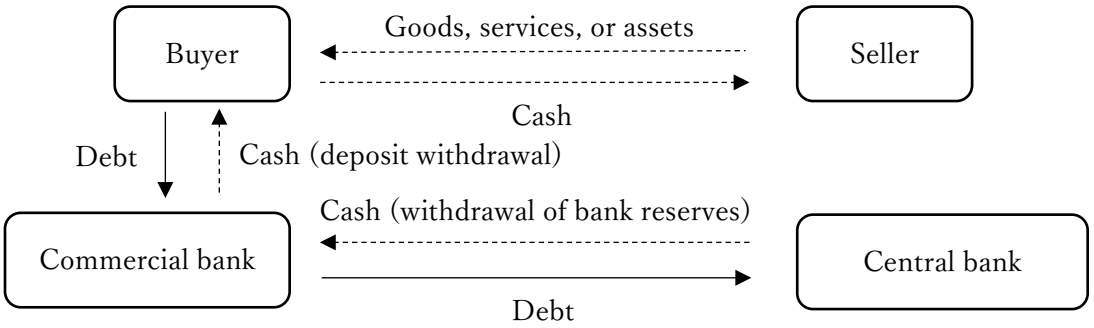
[4] See McLeay et al. (2014) for the inaccuracy of traditional explanations of money creation in economics textbooks.

Figure 2: When cash does not flow back to commercial banks in the current payment system

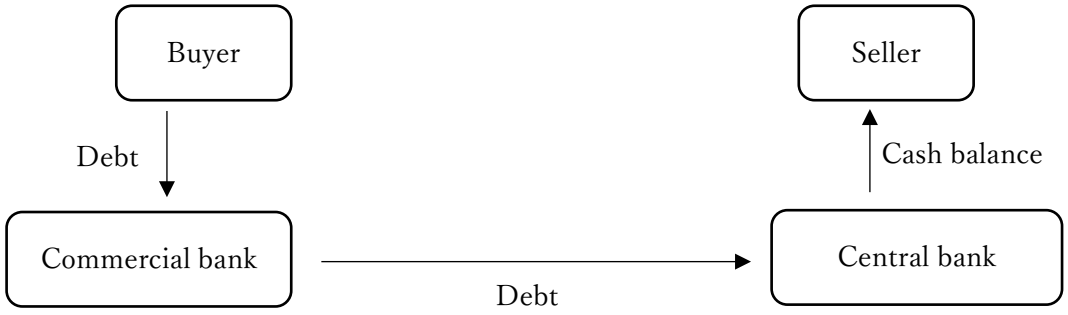
i. Debt exchange upon bank lending and the supply of bank reserves



ii. Withdrawal of bank reserves from the central bank and the cash settlement of a commercial or asset transaction



iii. Outstanding liabilities after the cash settlement of the transaction



Note: The dotted line shows flows of transactions, and the solid line shows outstanding liabilities. "Debt" from a commercial bank to the central bank in Panel ii is the debt owed by a commercial bank to the central bank due to borrowing bank reserves from the central bank in Panel i. In addition, "Cash balance" in Panel iii is not legally a debt. It is recorded as a debt only in the central bank's financial accounting.

3. Role of legal tender and the central bank in the current payment system

Panel iii of Figure 1 shows that the central bank is not involved in the credit chain established after a bank transfer settlement. Thus, the central bank is providing a bridge loan of bank reserves in Panel ii of Figure 1. Why can commercial banks not establish the credit chain in Panel iii of Figure 1 without involving the central bank? The reason is that from a bank's perspective, a bank transfer is a transfer of deposit liability. It is necessary to transfer the means of settlement of deposit liability to offset the burden of increased deposit liability for the bank receiving a bank transfer. Thus, commercial banks send a deposit liability with the means of settlement one another to give "finality" (irreversibility) to a bank transfer. The means of settling nominal liabilities, including deposit liabilities, that the court accepts unconditionally is called "legal tender." Usually, each country's law designates cash as the country's legal tender.[5] Since bank reserves are legally a balance of cash on deposit with the central bank, they function as a perfect substitute for legal tender in the interbank settlement of bank transfers.

As such, bank reserves play a crucial role in the swift settlement of bank transfers. An unnecessary restraint on the supply of bank reserves would impede economic activity. Such a restraint is usually averted because each country's law designates the central bank as the issuer of legal tender. Since the payment of legal tender settles nominal liabilities unconditionally under each country's law, its effect does not depend on any circumstance of the central bank. Thus, the central bank can always issue a sufficient nominal value of legal tender to redeem bank reserves, regardless of its financial condition. Hence, it is the effect of each country's law that ensures no unnecessary restraint on the supply of bank reserves or the swift settlement of bank transfers.

4. Can cryptocurrencies or security tokens replace conventional currencies?

Given the features of the current payment system outlined in the previous two sections, let us examine how fintech will change the payment system in the future. First, this section will discuss whether a new electronic record system based on cryptocurrencies or security tokens can be an alternative to the current payment system.

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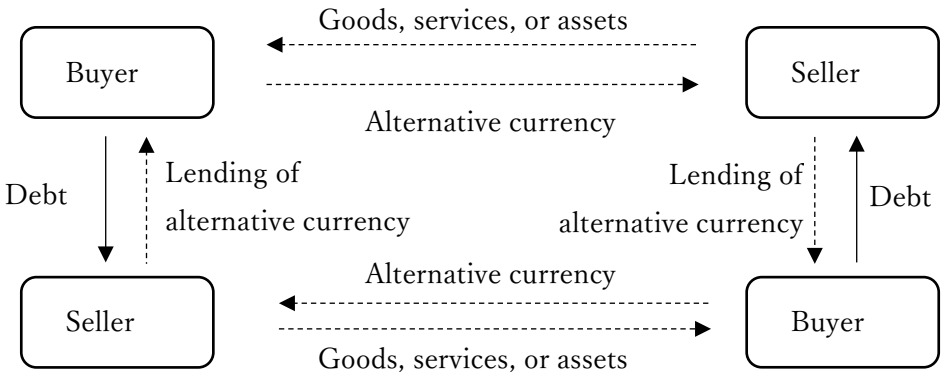
[5] The relevant acts in Japan are the Article 7 of the Currency Act and the Article 46, Paragraph 2 of the Bank of Japan Act.

Replacing the current payment system with a new electronic record system has an engineering advantage. It would allow building a payment system from scratch without being bound by the technical specifications of existing bank deposit account systems. On the other hand, a supply restraint is essential to cryptocurrencies and security tokens by design. Regarding stablecoins and security tokens, a new balance is issued in exchange for the custody of some assets by the administrator of electronic records. In the case of unsecured cryptocurrencies, such as bitcoin, the electronic record system issues a new balance in exchange for a prescribed action, such as necessary computation for transaction authentication. In either case, the system is not designed to issue new balances to those who are short of the means of payment, as in the current payment system with bank deposits. Therefore, if cryptocurrencies or security tokens circulate as alternative currencies, those short of currency balances can only borrow from those with a surplus of existing currency balances. The flow of funds would be as shown in Figure 3.

Figure 3: When electronic records such as cryptocurrencies and security tokens circulate as alternative currencies



Note: Dotted lines are flows of transactions, and solid lines are outstanding liabilities. In this figure, the "Seller," located in the upper right or lower left, is the first to hold the balance of an alternative currency. Transactions occur clockwise.

The disadvantage of this payment system is the need to secure a surplus of currency balances in advance to lend them to those who are short of currency balances. As a result of this cash-in-advance constraint, the supply of currency balances to those who are short of currency balances might be insufficient, widening fluctuations in interest rates. The cash-in-advance constraint would also reduce competition among lenders, which would, in turn,

elevate lending rates. If dealers would intermediate the lending of currency balances from sellers to buyers in Figure 3, an increase in lending rates would manifest itself as a widening of the bid-ask spread offered by dealers. Ultimately, the increased volatility of interest rates and higher lending rates will hamper economic activity by impeding the circulation of the means of payment and thus increasing transaction costs of goods, services, and assets between sellers and buyers.

In contrast, in the current payment system illustrated in Figure 1, commercial banks issue and lend their deposit liabilities to buyers who are short of the means of payment. There is no need to procure currency balances from external sources to lend to such buyers. Furthermore, to settle bank transfers, commercial banks can acquire bank reserves from the central bank, or through interbank call loans from other commercial banks, after they lend deposit balances to borrowers. Thus, there is no cash-in-advance constraint on bank lending as in the alternative payment system illustrated in Figure 3.

One might argue that even in the alternative payment system shown in Figure 3, the administrator of electronic records would be able to issue new balances to buyers who are short of the means of payment. However, as described above, cryptocurrencies and security tokens are not designed to allow the issuer to generate new balances freely. This institutional disadvantage and the aforementioned engineering advantage will be tradeoffs for the use of cryptocurrencies and security tokens as alternative currencies in the economy.

How to evaluate these tradeoffs can be controversial. Still, it is worth noting that commercial banks could extend a large amount of new bank lending soon after the beginning of the new coronavirus pandemic in early 2020. Such agile bank lending was possible because there is no cash-in-advanced constraint on bank lending in the current payment system. Had the current payment system been similar to that shown in Figure 3, borrowers' demand for the means of payment would have significantly exceeded the supply from lenders. Interest rates would have risen sharply as a result. Thus, the new coronavirus pandemic demonstrated the importance of agile bank lending, and the legal tender and central bank system that made it possible, in the modern economy. Given this observation, it seems difficult for an alternative payment system based on cryptocurrencies or security tokens to replace the current payment system only because of an engineering advantage.[6]

[6] However, it will not be the case if using alternative electronic currencies allows one to escape some taxes or regulations.

5. What will be the impact of fintech on the payment system?

The view expressed in the previous section implies that fintech will not change the primary form of money creation in the current payment system. Therefore, fintech will mainly impact the interface of the banking system and beyond, rather than the internal structure of the banking system consisting of a central bank and commercial banks. By facilitating connections between bank deposit account systems and non-banking systems for commercial and asset transactions, fintech will integrate banking and non-banking services more.

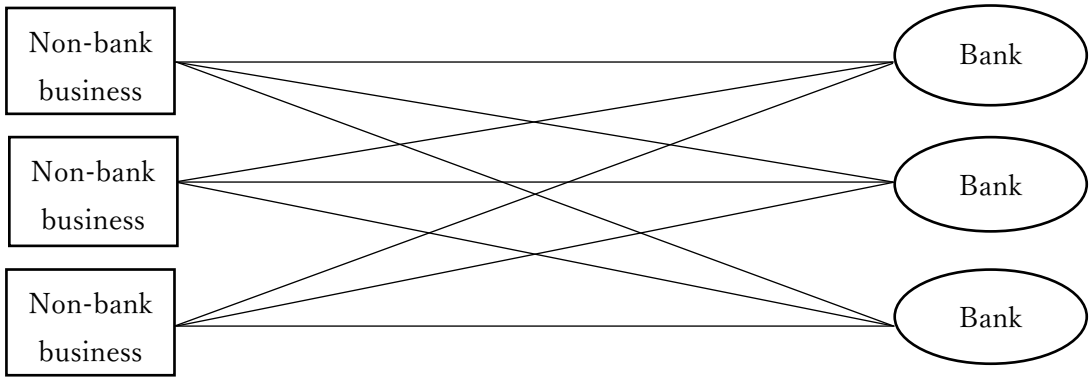
This outlook is not in itself new since it is similar to concepts such as “open banking," “banking as a service (BaaS),” and “embedded finance.” Still, this section will analyze the effects of fintech on the payment system from the tradeoffs described in the previous section. On the one hand, fintech will be a remedy to connect banking and non-banking systems without being bound by the technical specifications of existing bank deposit account systems. On the other hand, fintech will preserve the benefits of the current banking system supported by the legal tender and central bank system under each country’s law. From this perspective, this section will also predict that central-bank digital currency (CBDC) will be a kind of enabler service if implemented in a developed country.[7]

5.1 Shortcomings of the current banking system

A challenge in connecting banking and non-banking systems is the existence of multiple commercial banks. The fact that bank deposit account systems are managed separately by multiple banks contributes to maintaining the banking industry's efficiency by promoting competition among banks. However, non-banking systems must connect each banking system individually, each of which has a different technical specification (Figure 4).

[7] This view of central bank digital currencies is also expressed in Tomura (2021).

Figure 4: Direct connections between bank deposit account systems and non-banking systems for commercial and asset transactions



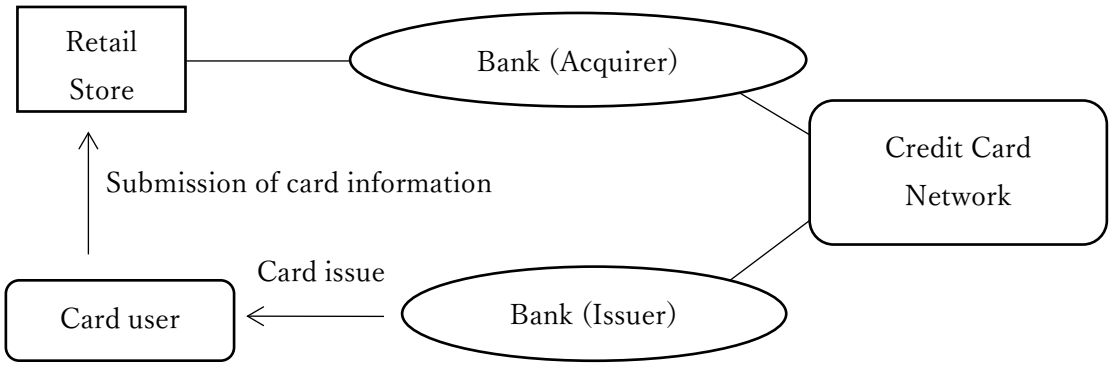
Note: Rectangles indicate non-banking systems, ovals indicate bank deposit account systems, and solid lines indicate inter-system connections.

5.2. Remedies for the shortcomings

The conventional solution to this problem is provided by a credit card network. If a buyer presents his/her credit card number to pay for a purchase at a retail store, then the bank issuing the credit card (called the "issuer") transfers the corresponding deposit balance to the store's bank account on behalf of the buyer. The issuer will debit the buyer's bank account later. For this transaction, the store sends credit card information to the issuer via the store's bank (called the "acquirer"), which can pass information to the issuer through a credit card network. Thus, each retail store only needs a network connection with its acquirer (Figure 5).[8]

[8] In Japan, a retail store usually communicates with the issuer via either an information relay system called "CAFIS" provided by NTT Data Corporation or "CARDNET" provided by Japan Card Network Co., Ltd. In Japan, a specialized credit card company, rather than a bank itself, often plays the role of an issuer.

Figure 5: Connecting banking and non-banking systems via a credit card network

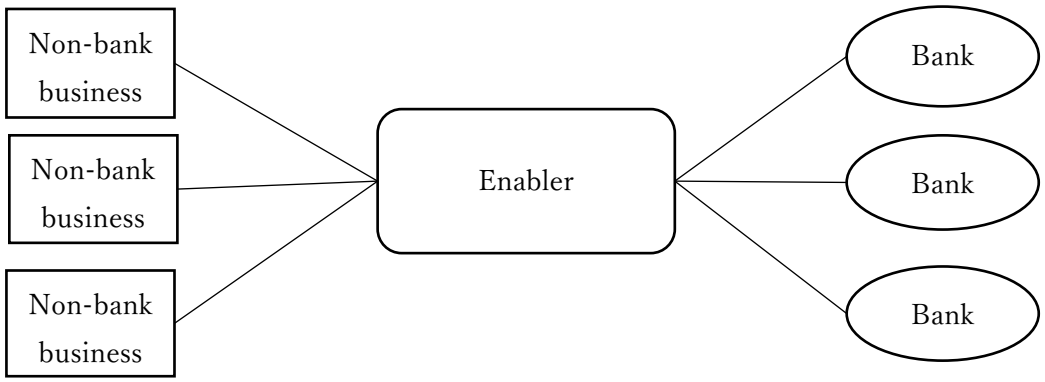


Note: The rectangle indicates a retail store's point-of-sale system, ovals indicate bank deposit account systems, and solid lines indicate inter-system connections.

A credit card network, however, is not a perfect solution, as its design is exclusively for retail businesses. Furthermore, using credit card numbers for customer identification is not necessarily convenient for card users because of the cumbersomeness of submitting credit card numbers manually and the risk of identity theft. This problem has become especially significant after the arrival of the Internet and smartphone applications.

Given this circumstance, new intermediaries have emerged to give more flexibility and convenience to connections between bank deposit account systems and non-banking systems. For example, Plaid, a U.S. company, offers an application programming interface (API) and a scraping service (i.e., using entrusted depositors' IDs and passwords to connect to Internet banking websites) to access bank deposit account systems. Non-bank companies using this service can allow their customers to make bank transfers and acquire bank account information within their smartphone apps. Using Plaid's modern API, they can design their Internet services more efficiently than in the case of directly accessing each bank's deposit account system. An intermediary like Plaid is called an "enabler."

Figure 6: Connecting banking and non-banking systems via enablers



Note: Rectangles indicate non-bank companies' Internet servers, ovals indicate bank deposit account systems, and solid lines indicate inter-system connections.

Now let us compare the connections of banking and non-banking systems via enablers with alternative payment systems based on cryptocurrencies and security tokens. As described in the previous section, alternative payment systems have an advantage in designing a technologically efficient payment system from scratch. On the other hand, enablers provide an efficient payment interface for non-banking businesses without eliminating the need for the current bank-based payment system. Thus, enablers are intermediaries that bring engineering efficiency to bank transfers similar to those of cryptocurrencies and security tokens while maintaining the legal and institutional efficiency of using bank transfers.

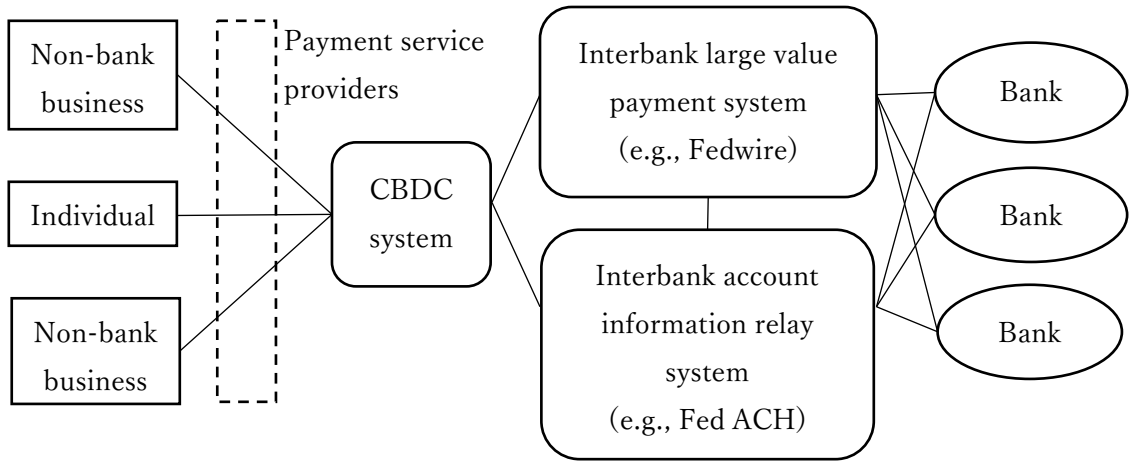
5.3. Central-bank digital currency as an enabler service

In response to the emergence of cryptocurrencies, especially stablecoins, central banks across countries are conducting research and experiments on central-bank digital currency (CBDC). Even though the final form of CBDC is yet to be known, CBDC seems often regarded as a substitute for physical cash in the current discussion among academics and professionals. In this view, a new financial system will be developed on CBDC, where banks take deposits of CBDC and lend them out to borrowers. This view is similar to the alternative payment system illustrated in Figure 3.

As explained in Section 3, actual commercial banks first obtain bank reserves from the central bank in exchange for liquid safe securities. Then they convert bank reserves into physical cash to disburse to depositors. Thus, the creation of bank deposits by bank lending precedes the issue of physical cash by the central bank. Given this understanding, the author

predicts that people will acquire a balance of CBDC by withdrawing their bank deposits if CBDC is implemented in a country with a developed banking system. In addition, the CBDC system must be connected to non-banking systems so that people can pay CBDC for their commercial and asset transactions. Thus, CBDC will intermediate connections between bank deposit account systems and non-banking systems as enablers do (Figure 7). The central bank has an advantage over non-bank enablers because it is already connected to commercial banks through the existing interbank payment system. On the other hand, since the central bank is a public institution, it may be less innovative and efficient in its services than private enabler companies.

Figure 7: Central-bank digital currency (CBDC) system as an enabler service



Note: Rectangles indicate non-banking systems and individuals, ovals indicate bank deposit account systems, and solid lines indicate inter-system connections.

6. Conclusions

The efficiency of the current payment system rests not only on engineering technology but also on the legal tender and central bank system enacted by each country's law. Given this understanding, this essay argues that the impact of fintech on the payment system will be mainly on connections between bank deposit account systems and non-banking systems. Fintech will not change the internal structure of the current banking system consisting of a central bank and commercial banks. Given this outlook, this essay predicts that central-bank digital currency will be a kind of enabler service to connect banking and non-banking systems if implemented in a developed country.

There is an ongoing discussion on utilizing fintech to design a new payment system among academics and professionals worldwide. For an efficient reform of the payment system, it would be essential to construct a vision based on the proper understanding of money creation in the current payment system.

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