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Bank of Japan

## **FinTech – Its Impacts on Finance, Economies and Central Banking**

*Remarks at the University of Tokyo - Bank of Japan Joint Conference in Tokyo  
on "FinTech and the Future of Money"*

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(English translation based on the Japanese original)

## **Introduction**

Undoubtedly, we are living in the age of remarkable innovation in information technology. It is fascinating to consider how it might change the future of finance and economies. In order to address these unprecedented and intellectually-challenging issues, close communication between academics and practitioners is essential. Accordingly, today's conference focusing on the future of money, jointly held by the University of Tokyo and the Bank of Japan, is of great significance.

Today's conference has been made possible due to the close relationship of trust between the Center for Advanced Research in Finance (CARF) of the University of Tokyo and the Bank. I would like to take this opportunity to express our deepest appreciation to Professor Ueda, Director of CARF, Professor Yanagawa and the staff of the CARF for their support in holding this conference. My speech today will focus on this key word of "trust".

### **I. Innovation in Information Technology and FinTech**

#### *Information Technology and Financial Service*

After the rapid economic expansion in the second half of the 20th century, developed countries all over the world are now facing the common challenge of how to raise their growth potential. Looking back at history, many major companies that supported the economic growth of the 20th century, such as those in the iron and steel, automobile and petrochemical industries, were established after 1900. For example, U. S. Steel was established in 1901, Ford in 1903, Royal Dutch Shell in 1907, and GM in 1908, and they quickly grew to lead the economy. This suggests that, when new technologies reach a take-off stage at which they can be used for business, they have the potential to completely and rapidly change the economic landscape far beyond what could have been expected at the infancy stage of innovation.

Compared to those manufacturing industries, financial industry has a relatively old history: some banks' history can trace their history back to the Renaissance period. This is because, infrastructures such as "money" and "ledgers," which constitute the basis for financial services, have been around far longer than the basic technologies of the recent manufacturing industries such as automobiles.

Nonetheless, many people now expect that rapid innovation in information technology will have a substantial impact particularly on financial services. In my view, there are two reasons behind such possible linkages between recent information technology and financial services.

First, the financial service industry can be regarded as "information industry," since financial services such as payment and settlement, investment decisions and risk management are based on wide-ranging information processing.

Second, some of recent inventions in information technology such as blockchain and distributed ledger technology (DLT) have the potential to significantly affect "money" and "ledgers," which are the basic infrastructure for financial activities. Such possible impacts of information technology on money and ledgers raise many interesting issues from the perspective of economic theory, as illustrated by the theme of today's conference.

### *Technological Backgrounds of FinTech*

Next, I would like to focus on the context of technological innovations behind "FinTech." In my view, these innovations can be categorized into three types.

The first category includes "blockchain" and DLT, which were invented in 2008 with the concept of "bitcoin."

In the second category, there are artificial intelligence, or AI, and big data analytics, which are evolving in line with dramatic increases in computing power.

The third type of technological innovation includes the cellphone and smartphone, which have become new means of accessing financial services. Indeed, the appearance of "iPhone" in 2007 triggered new wave of devices for accessing various financial services and influenced business models of the financial industry.

These technologies differ in terms of the degree of application to business. Although blockchain and DLT, which were born in 2008, are attracting attention as a flagship technology in FinTech, most of the efforts toward putting the technology into practice are still at the experimental stage. In contrast, many firms are now competing with each other to provide financial services through smartphones and apps.

## **II. Impacts of FinTech on Financial Services**

Next, I would like to focus on the possible impacts of FinTech on financial services.

### *Unbundling and Restructuring of Financial Services*

First of all, FinTech would have the potential to "unbundle" and "restructure" the existing financial services.

Most commercial banks take deposits, and engage in both processing payments and making loans. The consequent "fractional-reserve" banking accompanied by "maturity transformation" can be a cause of bank-runs, which sometimes triggered crises in the past. This is why central banks serve as a "lender of last resort (LoLR)" mainly for banks in order to prevent financial crises.

On the contrary, non-bank FinTech companies do not take deposits. Some of them focus solely on payment services, while others provide fund intermediation services such as P2P lending without using their own balance sheets. Moreover, many FinTech companies are trying to realize "economies of scope" through combining financial services with other activities related to e-commerce, sharing-economy businesses and big data analytics in order to deliver new added-value.

### *"Globalizing" Financial Services*

Moreover, FinTech has the potential to "globalize" basic financial services through enhancing "financial inclusion." Not only in advanced economies but also in developing and emerging economies where financial services are not yet widespread, cellphones and smartphones are now spreading rapidly, and FinTech has opened up the possibility of providing basic financial services through these new instruments.

### *"Personalizing" Financial Services*

Furthermore, FinTech may facilitate "personalized" financial services. Cellphones and smartphones have characteristics of "personalized" tools, and FinTech now makes it possible to analyze individual customers by utilizing big data. By combining such new tools with analytics methodology, FinTech may make it easier for the industry to provide more customized services.

Also, new technologies of FinTech can be used to explore the frontiers of financial services through "dynamic" customization. For example, buying insurance policy can impair the policyholders' incentives to be sufficiently cautious, and such "moral hazard" is an inherent problem of insurance. In this regards, blockchain technology is expected to enable "smart contracts" for various purposes, such as continuously adjusting automobile insurance fees in accordance with driving behavior of each policyholder. As this case illustrates, smart contracts might have the potential to overcome "moral hazard" by leveraging new information technology.

### *"Virtualizing" Financial Services*

In accordance with the development of information technology, hard infrastructure such as brick & mortar branches and ATM machines may not be prerequisites for providing financial services. In this regard, I have found similar characteristics between such changes in business models and the recent "Pokémon GO" boom. Game companies used to focus on popularizing the necessary hardware such as DS, X-BOX and PlayStation before releasing game software. In contrast, "Pokémon GO" suddenly became popular worldwide because people can start playing it simply by downloading the app to their own smartphones.

It is technically possible to imagine a "virtual bank," which owns no tangible infrastructure and instead uses the internet, smartphones, cloud computing, AI, and DLT to provide access to financial services, to make investment decisions and to manage risks.

### *New Issues*

Although FinTech has many upsides, it brings new issues regarding payment, settlement and financial stability.

First of all, we need to consider whether and how FinTech will change the structure of settlement and other financial services. At the Pittsburgh Summit in 2009, the G20 leaders agreed that all standardized OTC derivatives contracts should be cleared through central counterparties (CCPs). With the introduction of new technologies such as DLT, how might these new "decentralization-oriented" technologies affect the "tiered" settlement structure with centralized bookkeepers?

Also, regulatory and supervisory authorities obtain much information through the balance sheets of financial institutions, and many regulatory frameworks such as capital requirement, leverage ratio and liquidity standards impose constraints on these balance sheets in order to achieve and maintain financial stability. In the case of nonbank P2P lending firms, it is difficult to obtain sufficient information regarding financial intermediation from their balance sheets. Moreover, imposing constraints on these balance sheets may not be very effective for influencing their P2P lending activities. Accordingly, financial authorities need to consider how they can obtain the necessary information for maintaining financial stability.

Ironically, innovation in information technology has simultaneously brought about various new tactics for cyber threats. In addition, financial networks are becoming increasingly accessible through open gateways such as the internet and smartphones. This makes it more and more important to take appropriate measures against cyber threats in order to ensure the stability of the payment, settlement and financial systems.

### **III. Economic Implications of FinTech**

Next, I would like to examine the possible impacts of FinTech on the economy.

Obviously, finance is a great creation by humans. By using very sophisticated information processing systems bundled as finance, human beings can continuously allocate a finite resource to productive areas with potential. This, in turn, has served as a dynamic driving force for humans' building of economic society. Therefore, if innovation in information technology and FinTech enhance the efficiency of finance, it will and should eventually contribute to economic development.

"Financial inclusion" stimulated by FinTech clearly illustrates the positive feedback between finance and the economy. If people in developing countries gain new access to financial services through FinTech, they will gain opportunities to expand business such as e-commerce and e-learning, which are currently hampered by constrained access to payment services. In this manner, FinTech is expected to contribute to economic development.

However, in developed countries where basic financial services are already widespread, it would not be easy to quantitatively assess the impacts of FinTech on the economy through existing economic statistics.

For instance, if banks, while reducing the cost of maintaining their bricks & mortar branches, improve services through free apps downloaded to each customer's smartphone, it would not be very certain how existing economic statistics reflect the economic impacts (i.e., the decrease in fixed investments and the improvement of free apps). Also, if FinTech stimulates the development of sharing-economy businesses, how to reflect the consequent increases in utilization rates of various idle assets, such as unused rooms in individual houses and parked cars in front yards, in economic statistics will be another interesting issue. These examples give rise to the challenging issue of how economic statistics can grasp the increases in economic welfare caused by innovations in information technology.

Moreover, if FinTech stimulates economic transactions through the internet and smartphones as well as business applications of DLT, it might become increasingly difficult to identify the physical "location" where transactions take place and the relevant ledgers are kept. This could lead to a variety of issues including those related to regulation and taxation.

#### **IV. Central Banking and FinTech**

As stated in the theme of today's conference, FinTech encourages us to think about the future of money and central banking.

##### *"Information" and "Trust"*

Most central banks were born after the establishment of modern nation-states and have been serving as the single issuer of sovereign currency as their liabilities. These historical facts illustrate that central banks inherently have characteristics as "centralized bookkeepers." In view of such "centralized" attributes of central banks, people are interested in the issue of how the new "decentralization-oriented" technologies such as blockchain and DLT will influence the future of currency and central banking. Such interest is linked to the specific question of: what happens if virtual currencies such as bitcoin reach a significant circulation?

Indeed, if virtual currencies such as bitcoin are to be widely used to purchase goods and services directly, there should of course be influences on monetary policy. At present, however, the consensus view in various international forums is that virtual currencies are unlikely to overwhelm sovereign currencies. This issue is deeply related to "trust,"

which is indispensable to all financial activities.

Needless to say, finance is an activity of creating added value through making links among multiple entities such as "payer" and "payee" or "lender" and "borrower." Those financial activities always have to be supported by "trust" among such entities.

In order for any asset to be used and accepted as currency, it must have sufficient "trust" among a wide range of users. In this respect, "bitcoin" attempts to create a "chain of trust" from scratch, but this requires substantial costs for the electric power needed to verify transactions called "mining" and to manage encryption keys. Therefore, if we already have an entity with sufficient trust, it is rational and efficient to make that entity issue the currency as the single issuer as its liabilities. Because of this economic rationality, in most countries today central banks issue sovereign currencies in a centralized manner, even though they are newcomers in the history of finance.

#### *Co-existence of "Centralized" and "Decentralized" Frameworks*

Although the information processing capacity of humans is limited, "trust" dramatically enhances the efficiency of information processing. If we cannot trust others, we must always carry hundreds of keys with us and manage them. This would make life very difficult!

Finance has supported economic society by enabling advanced information processing through making effective use of "trust," such as trust in payment instruments and trust in information managed through ledgers. If such "trust" in financial activities is lost, the efficiency of information processing will be severely damaged, causing huge turmoil in financial markets and the economy. Also, if it is necessary to pay huge costs to maintain trust such as by keeping all the ledgers closely and continuously monitored by all the relevant entities in order to ensure they are not altered, then economic and financial activities would be substantially hindered.

In a similar vein, if people have to worry about possible fluctuations of the value of the payment instruments received as settlement of past transactions, it becomes difficult for them to allocate their limited resources to forward-looking activities. In this respect, central banks are legally and institutionally destined to maintain the stability of the value of the currency, and by using the central bank currency people can save their limited resources from being ineffectively spent.

Also, in the practice of bitcoin transactions, encryption keys have sometimes been entrusted to a third party in a centralized manner, but there have been some incidents such as the failure of Mt. Gox in 2014. In this case, people tried to avoid the cost of managing keys accompanying decentralized-type information processing by entrusting their keys to a third party, Mt. Gox. But their trust was destroyed by the misconduct of the third party. In this regard, the problem of the Mt. Gox case did not stem from DLT itself but was similar to classic cases of misconduct in the financial industry. As this case illustrates, decentralization-oriented technologies will not eliminate centralized frameworks due to the limited information-processing capacity of financial service users. Furthermore, this incident clearly showed that maintaining "trust" is critically important in any financial services, regardless of the types of applied technologies.

I believe that it is entirely possible and desirable to realize the co-existence of "trusted centralized systems" and "decentralized systems," used as and when necessary. We need to make a great effort to design the optimum framework for economic society through utilizing the available technologies. These frameworks should take into consideration the various incentives of economic entities to ensure people's "trust," which is indispensable to financial activities.

### *Information Technology and Central Banking*

The central bank is the only entity that can provide "central bank money" without constraints. Central bank money has "finality" in the sense that people no longer have to worry about "payment unwinding" or "the issuer's credit risk." Formerly, the central bank provided central bank money solely through paper-based and printing-related technologies such as banknotes and paper-based ledgers. With the development of the economy, the central bank has adopted newer technologies, improved its own infrastructure and continuously provided advanced infrastructure such as electronic-based wholesale RTGS systems. If the central bank had rejected digital technologies and only provided banknotes as payment instruments with finality, then economic development would have been substantially constrained.

As this fact illustrates, the central bank must appropriately adopt available technologies so as to provide the optimal core infrastructure for economic society. That means the central bank itself must keep abreast of technological innovation.

Banknotes are payment instruments with finality and can be used at any time, by any

one, and in this regard some have recently argued that the central bank should issue its own digital currency as a substitute for banknotes. Their argument for central bank digital currency seems to be based on the increased awareness of the costs of processing and storing paper-based banknotes, and they ask the central bank to adopt the newest information technology in order to satisfy the needs of the economy. I guess that this issue will be one of the topics discussed in today's conference.

The Bank of Japan has no specific plan at present to issue digital currencies as a substitute for banknotes. Nonetheless, the Bank will make utmost efforts to deeply understand new technologies including blockchain and DLT. The Bank will also continue to conduct various research and analyses of these new technologies, while seeking the possibility of improving its own infrastructure through applying them in future.

The issue of central bank digital currency raises diverse topics that are attracting attention from academics. For example, to whom should the central bank provide its account, as technological innovation changes the financial structure and the list of financial service providers? To what extent should the central bank provide "finality" to economic society? How should the information linked to payment transactions be handled? The Bank, in close cooperation with academics, will make its best effort to deepen its understanding of such issues.

## **Conclusion**

Looking back at the history of human beings, technological progress has fundamentally helped to increase people's welfare and develop the economy, though it has sometimes been accompanied by negative aspects such as the use of technologies in wars and environmental pollution.

Thus, policymakers should strive to maximize the benefits of technological progress while minimizing its negative aspects. Since recent innovations in information technology have the potential to cause impacts particularly on financial services, how to deal with recent financial innovation symbolized by the word "FinTech" will be the key to designing the economic landscape in the 21st century.

In dealing with financial innovation and FinTech, there are many new and challenging issues. In order to overcome those issues, we need to cooperate with a wide-range of entities, including private businesses and academics in particular.

Today's conference, co-hosted by CARF of the University of Tokyo and the Bank, clearly illustrates that new information technology is raising many issues for economic theories and central bank practices. I firmly believe that this conference provides an important opportunity for academics, practitioners and central bankers to tackle the new challenges.

I sincerely hope that today's conference will be a fruitful opportunity for all of you.

Thank you for your attention.

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