

## Summary of the Forum on Payment and Settlement Systems on March 17 and 18, 2016\*

(\*This is an English translation of Japanese original released on April 13, 2016)

### 【Executive Summary】

The Bank of Japan held the "Forum on Payment and Settlement Systems" on March 17 and 18, 2016<sup>1</sup>. The agenda of the Forum focused on retail payment issues on March 17 and on wholesale payment issues on March 18, respectively.

On March 17, Governor Haruhiko Kuroda made opening remarks entitled "Innovations in Payments and FinTech: The Central Bank's Perspective<sup>2</sup>." On March 18, Executive Director Shigehiro Kuwabara also made opening remarks entitled "Enhancement of Payment and Settlement Systems and the Bank of Japan<sup>3</sup>."

The presentations on March 17 were focused on the issues regarding retail payment innovation, digital currencies and their background technologies (i.e., blockchain and distributed ledger technologies) as well as their impacts on retail payments. They also illustrated the issues regarding the applications of those technologies to various financial businesses.

After the presentations mentioned above, the participants discussed wide-ranging issues, including the following:

- 1) the benefits of blockchain and distributed ledger technologies
- 2) the challenges in applying blockchain and distributed ledger technologies to wide-ranging financial businesses
- 3) the issues regarding data security (e.g., the risks of cyber-attacks and leakages of private information)

<sup>1</sup> In advance of the forum, the Bank openly announced to accept the application for making a presentation at or participate in the Forum. The Bank received many applications from wide-ranging firms, including non-financial institutions related to payment businesses and FinTech. (Please see the appendix 1 and 2 for the list of participant companies and organizations.)

<sup>2</sup> Available at [http://www.boj.or.jp/en/announcements/press/koen\\_2016/data/ko160317a.pdf](http://www.boj.or.jp/en/announcements/press/koen_2016/data/ko160317a.pdf)

<sup>3</sup> Available at [http://www.boj.or.jp/en/announcements/press/koen\\_2016/data/ko160318a.pdf](http://www.boj.or.jp/en/announcements/press/koen_2016/data/ko160318a.pdf)

- 4) the issues regarding KYC (know your customer) principles and relevant compliance duties
- 5) the future prospects of virtual currencies such as Bitcoin

The presentations on March 18 focused on the issues regarding wholesale payments and settlements, such as the enhancement of payment and settlement systems, the frontiers of effective utilization of BOJ-NET, the variety of options for raising foreign currency-based liquidity through BOJ-NET, and the potential for applying blockchain technologies to wholesale payments and settlements.

After the presentations mentioned above, the participants discussed various issues, including the following:

- 1) "network externality" of payment and settlement systems
- 2) practical issues to be resolved in order to enhance payment and settlement systems
- 3) how to strike the appropriate balance between utilizing the scalability of payment instruments and maintaining multiple options for choosing the most suitable one
- 4) the relationship and conflicts between technological development and institutional frameworks

## 1. Sessions on March 17

(1) Presentation 1: Impacts of digital currencies and distributed ledger technologies on retail payments and relevant issues (by Mr. Kenji Hoki, KPMG AZSA LLC)

(Summary of the presentation)

Distributed ledger technologies (DLTs) have the potential to dispense with a trusted entity to control the master ledger and thereby to reduce the costs for ICT-related investments and personnel expenses. DLTs can be applied not only to digital currencies but also to goods and services, and to wide-ranging financial businesses.

When digital currencies become to be widely used, people will not have to have bank accounts for payment purposes. In such cases, commercial banks might become unable to provide "finality" to payments, and financial intermediation outside commercial banking sector might become more pronounced.

**【Opinions expressed at the following discussion】**

(On compliance and KYC <know your customer> principles)

- In payments through "public"-type DLTs, where anyone can participate in "mining" processes, it would be necessary to consider how compliance requirements such as KYC principle could be satisfied.
- In many cases, "private"-type DLTs, where limited number of members are allowed to participate in "mining", have been developed by traditional financial institutions, in order to enhance efficiency and to reduce the costs regarding financial businesses with complying with existing regulatory frameworks. On the other hand, "public"-type DLTs have been developed mainly by non-financial institutions without paying particular attention to financial regulations. Therefore, how to comply with KYC requirement and other financial regulations remains to be a future task.

(On "public"-type DLTs and "private"-type DLTs)

- In terms of applying DLTs in securities settlement, private-type DLTs would be an only feasible choice since public-type DLTs would be a bit too costly and take too much time in finalizing the settlements.
- Thinking about burdensome post-trade procedures in securities transactions, applying private-type DLTs, instead of public-type DLTs, to securities transactions would be a practical solution.
- In terms of applying DLTs to fund settlements, it would be difficult to judge which is better, public-type DLTs or private-type ones. Private-type DLTs seem to be suitable to real-time gross settlements since they could provide irrevocability of payments within a limited timeframe. Since the transaction volume of retail payments could be substantial, nonetheless, public-type DLTs could be better in terms of managing such a huge amount of transactions.
- Public-type DLTs would be suitable especially for retail payments with huge volume and standardized procedures. Nonetheless, it would be necessary to overcome the possible flaws in public-type DLTs such as lengthy process of "mining" that could hinder real-time settlements. As Governor Kuroda mentioned in his speech, there are many people who are out of the sphere of existing banking services in overseas economies. If they increase the use of virtual currencies based on public-type DLTs, virtual currency could prevail instead of sovereign currencies. Taking such possibility in account, it cannot be denied the possibility that public-type DLTs are used for fund settlements.

(2) Presentation 2: Issues regarding the application of blockchain technologies to financial businesses (by Mr. Ryu Takaki, IBM Japan, Ltd.)

(Summary of the presentation)

As issues regarding the application of blockchain technologies to financial businesses, we could raise various issues including (a) securing anonymity of transactions, (b) transparency, (c) the delay in providing finality due to "forks" in blockchain, and (d) how to continuously maintain the incentives of "mining."

IBM has developed "IBM Open Block Chain" so as to overcome the issues raised above. Moreover, our company has embarked on joint experimental works with other relevant firms in order to enhance efficiency of post-trade operations in securities transactions.

In applying blockchain technologies to financial businesses, it would be important to "standardize" those technologies so as to facilitate wider use. Our company is participating in a global project called "Linux Foundation Hyperledger Project," which is aiming at the standardization of blockchain technologies.

**【Opinions expressed at the following discussion】**

(On "finality" of settlements)

- Regarding "finality" of settlements, it seems that Japanese banks generally consider the "finality" of settlements very strictly while overseas banks tend to grasp the "finality" less strictly. When internet was introduced in Japan, there were some Japanese people who argue that internet would have risks since the connection of internet was on a "best-effort" basis. Thinking about the popularization of internet, it might be meaningful to consider to what extent the "finality" of settlements should be seriously considered.
- Public-type blockchain technologies, which are used in Bitcoin, do not provide "100 percent finality" in a strict sense due to the possibility of "forks." Thus, the word of "probability" is sometimes used instead of "finality." It is often argued that the possibility of "settlement unwinding" is negligible since its probability is extremely low. Nonetheless, it is understandable that financial institutions, especially Japanese financial institutions, tend to ask 100 percent finality". Our company, as a company operating in Japan, is making its best efforts to satisfy such needs of Japanese financial institutions.

- In order to provide "finality" in private-type blockchain technologies, it would be necessary that some designated members create a preliminary "block" and the other members approve it. In such framework there are a couple of caveats. For example, maintaining the structure of "hash chains" might become the obstacles for the efficiency of such procedures. Moreover, since the traditional protocol for Byzantine Fault Tolerance is based on the upper limit on the number of nodes in failure, it would not be completely sure whether appropriate control of node membership could be enforceable or not.

(Benefits of blockchain technologies)

- In applying blockchain technologies to fund settlement systems, it would be important to consider whether they could provide more benefits than the current systems. In this regard, we need to consider to what extent blockchain technologies are beneficial in various aspects such as (a) real-time settlement, (b) 24-hour operations, and (c) the costs for settlements.
- In applying private type DLTs to funds settlements, the cost reduction effects are critical since "trusted third parties" to evaluate the transactions and to maintain the ledgers would still remain. Nonetheless, compared to the current system, there would be some benefits in those regards, and the magnitude of those benefits should be evaluated through forthcoming experiments for application.
- It would be difficult to expect to what extent the users could enjoy the reduction of payment fees since it would also reflect fee strategies of system providers. Nonetheless, in order to increase the benefits of blockchain technologies, it would be desirable to establish bigger network with many financial institutions as possible. The larger the fund settlement network through blockchain technologies grows, the bigger the benefits of the end users would be.

(Privacy of transactions)

- In private-type DLTs, some participants might worry about the privacy of transactions. It would be problematic if any participant in a private-type blockchain could access to the record of transactions of other participants. Therefore, it is important to establish frameworks that can verify their transactions while guarding the privacy of them in private-type blockchain.
- As a system provider, our company is developing various systems while being fully aware of the importance of transaction privacy.

(3) Presentation 3: Frontiers of applying DLTs to businesses (by Mr. Yuzo Kano, bitFlyer, Inc.)

(Summary of the presentation)

Our Company (bitFlyer), while operating exchanges for digital currencies, has been continuously doing research and analysis of the issues regarding the application of blockchain technologies for these two years. As promising areas for applying blockchain technologies, we could raise, for example, the management of credit history and real estate transactions.

In order to resolve the issues in the existing blockchain technologies, our company is developing its own blockchain technologies. I believe that our technologies, if applied to financial transactions, would enable high-speed processing of transactions, which the existing blockchain technologies cannot bring about.

【Opinions expressed at the following discussion】

(On "finality" of transactions processed through blockchain technologies)

- If blockchain technologies are applied to financial transactions, "finality" of transactions would be an important issue.
- "Finality" is a concept with various meanings, and it would be necessary to classify them into several categories. (a) When transactions are fixed on the system, such a state could be called as "commitment". (b) When transactions are settled between commercial banks, such a phase could be entitled as "weak-finality", in which there remain the credit risks of relevant commercial banks. (c) When transactions are settled through central bank money, such a phase could be called as should be defined as "strong-finality".

(Blockchain technologies and processing of big data)

- What would be the benefit of using blockchain technologies in processing big-data?
- It would be desirable if the infrastructure for processing big data is solely established. The public-type blockchain technologies can be used for big data processing since the interface of its technology allows anybody to access and input information and is shared by many entities.

- However, we should be aware about the security issues including hacking when using public-type blockchain.
- "Security" has a multilayered concept. For example, it includes (a) internet security at infrastructure level, (b) security of blockchain, (c) security of application. "Information sharing with protection of personal information" is conceptually not so difficult because information can be hashed.

(Future prospects of digital currencies)

- Bitcoins are thought to be used for investment and not as a settlement measure. It would be used as a settlement measure if it becomes more largely used.
- Bitcoins are more likely to be used as an object of investment and speculation. The current volatility of the Bitcoins is three to ten times higher than the one of dollar-yen rate so that it is attractive for investing rather than using it as a settlement measure. Such high volatility would be settled down as users increase, and someday it may be used as one of the currencies. Moreover, for example in developing countries where confidence towards own currency is low, Bitcoins may substitute the sovereign currencies in the future. Now, "Ethereum" is attracting many people's attention as a measure to realize smart contract, Bitcoins are also possible to apply to smart contract.
- The practical use of the blockchain to the real estate transactions is attractive as it has a possibility that a blockchain can be utilized to social base infrastructure. On the other hand, blockchain is based on a mechanism which all the participants share the same structure, so once it is built-in, it is not easy to change and update.
- Indeed, in order to change the structure of the Bitcoins itself, a lot of work is needed to reach agreement. As a countermeasure, transferring data such as the current real estate register into meta data including image data to save room for elastic response could be considered.

(4) Forefront of developments towards practical use of distributed consensus ledger (by Mr. Yasunori Sugii, Currency Port)

(Summary of the presentation)

The blockchain can be used widely, not only in financial businesses and certification of contents (for commercial and property registration) but also in industries that use automatic transactions utilizing Internet of Things (IoT,) etc.

Public-type and private-type blockchains have respective advantages and

disadvantages. It is therefore important to come up with ideas for linking these two types of blockchains and complementing characteristics of respective types. For example, when newly issuing values, those values can be kept on the public-type blockchains that excel in external auditability, while their transactions can be managed on the private-type blockchains that are good at high-speed processing.

For practical application of the blockchain, it is also important to link the blockchain technologies with those in other fields. For this purpose, it is necessary to provide opportunities for matching engineers from major research institutes with those specialized in blockchain technologies.

**【Opinions expressed at the following discussion】**

(Management of intellectual property and standardization)

- I am interested to know whether blockchain and other FinTech-related technologies should be open or proprietary from the standpoint of intellectual property strategies.
- I hear from time to time that people outside the FinTech community are interested in owning FinTech-related intellectual property, but I believe that the FinTech-related technologies should in principle be open, and that otherwise the technologies will not be robust as infrastructure.
- In consideration of the fact that the blockchain is a technology to be used by a large number of participants, I think it imperative to develop a common protocol. In this sense, it is important that the basic parts of the technology be open to let many people use it, creating a "forum" for linking with one another instead of letting someone gets a patent which makes the technology less accessible for others. Each participant should determine what values they should add in the "forum."
- At present, when issuing values on the blockchain, the design of the colored coin<sup>4</sup>, such as the virtual currency "Coinprism," is first established, and then other participants join to form the community. Nonetheless, in order that the values be used in a more versatile manner as "currency" or "securities," standardization through the work of ISO and cooperation among central banks might be necessary.

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<sup>4</sup> Using the colored coin, it is thought that, by embedding information on transfer of assets on the blockchain of the Bitcoin, it is possible to utilize the advantages of the Bitcoin network, such as the size of participants and credits, while realizing a new mechanism for asset transfer.

(Use of virtual currency and credit-card payments)

- From the standpoint of the infrastructure, which develops the electronic means of settlement for credit-card member stores, I do not think that they are very willing to invest in new infrastructure unless the direction of future settlement measures is clearly seen, and at the same time, I do not think that consumers are willing to switch to the settlement measures that are not accepted by many stores.
- In this regard, whether or not the credit-card member stores will accept virtual currencies or other new settlement measures, if the issuers of the credit cards such as VISA and MasterCard start accepting various settlement measures including virtual currencies, it may be possible to realize multiple settlement measures by simply using the existing networks of VISA or MasterCard.

(Involvement of academic society in blockchain studies)

- In order to develop the blockchain technologies, I believe that the contribution of scientists and academia will be important. To this end, it is essential that this technology area ensures opportunities for academics to gain status and prestige by publishing research papers.
- As a researcher in the related fields for many years, research papers in these fields were once hard to be accepted, however, such papers are nowadays recognized as "research study on important technologies that are used in the society." The situation is now much better for researchers.

(Measures against cyberattacks)

- I felt that the concept of linking public-type and private-type blockchains was very useful. On the other hand, if the public-type blockchain becomes beyond the role of Bitcoin and be utilized as basic social infrastructure, this would more likely induce cyberattacks on the blockchain. Addressing these threats will be one of the critical issues.
- I agree that wider use of blockchain can induce cyberattacks. Also, it is hard to say that the validation system of the public-type blockchain is "environmentally friendly." Having said that, the future trend of the technologies has a lot of uncertainties, including the development of an algorithm that would replace the existing validation system.

(5) Closing Remarks (by Mr. Shuji Kobayakawa, Bank of Japan)

The presentation today highlighted the keywords "distributed ledger" and "blockchain." This indicates how the blockchain technology is providing a spark to bring innovation to payment services. Keeping this in mind, I would like to raise the following three points on today's discussions.

First, there are arguments about the sustainability of the blockchain technology. It was pointed out that with the "private-type distributed ledger," it is possible to carry out validation on a real-time basis since the number of validators is limited. Generally, with the "public-type distributed ledger," it is believed that it takes some time to perform the validation process, however, with the private distributed ledger, the validation process can be performed more efficiently, and it may potentially overcome the problems which the public-type distributed ledger faces. Some views are heard in overseas that the private-type distributed ledger technology is more sustainable. If such technology that allows real-time validation is used, consideration will be promoted in the future not only on administrative work of issuance and custody of securities more efficient, but also on possibility of simultaneous settlement of securities and funds. In the meantime, it was also pointed out that mutual linkage of public and private-type distributed ledgers could complement characteristics of the two types. In the world of economics, there is a notion of co-opetition for the growth of the entire industry, where the companies belong to, namely, having advantages of both competition and coexistence. The concept of linkage may lead to initiatives to realize the notion in the field of technology.

Secondly, there were active discussions on utilization of blockchain technology and finality of settlement. In particular, in order to ensure finality, there were specific opinions on the model that a certain lead validator plays the central role in securing the finality of the blocks. The distributed ledger has been thought to be innovative in its model that the validation by a trusted third party is absent. However, there is a possibility that a technology involving a lead validator is more compatible with real-life business models. Furthermore, if a lead validator is to play a role in enhancing people's confidence in the blockchain technology, this may further drive development of these technologies.

Thirdly, in order to make payment services more usable, it is essential to promote standardization and commonalization of technologies as well as to improve externality of the network. From this viewpoint, we will need to keep close attention on the future direction of Hyperledger Project of Linux Foundation, an expert of open source technologies, for standardization with involvement of various interested parties.

Looking at the recent trend of FinTech, there is a difference from previous movements on enhancement of settlement services in that, in addition to financial institutions, a wide range of entities including information-related and startup companies are seeking entries into the field and trying to create values. Meanwhile, as a central banker, I would like to continue discussions with relevant parties working on FinTech to see whether new entrants and new payment services will help improve efficiency of the payment systems through improved usability for users, as well as to ensure the safety and security of the payment systems.

## 2. Sessions on March 18

### (1) Enhancement of Payment and Settlement Systems and BOJ-NET as Basic Infrastructure (by Mr. Seiya Hikuma, Bank of Japan)

(Summary of the presentation)

The Bank of Japan operates the BOJ-NET that is the basic infrastructure for Japan's economy. In order to respond to recent trends such as globalization of financial transactions and enhancement of financial services, the Bank built the new BOJ-NET, which is a flexible system with the latest information technology, that started full-scale operation last October. Further, since this February, the operating hours has been extended to 9 o'clock in the evening. This increased the settlement hours that are overlapping with operating hours of overseas markets, and is expected to contribute to speeding up the cross-border settlements of funds and JGBs. Further utilization of the BOJ-NET is being discussed at the "Forum Towards Making Effective Use of the BOJ-NET."

Looking at the small-value payments, initiatives are progressing at major overseas countries to enable real-time payment of remittances on a 24/7 basis, including on weekends, during late night hours and during early morning.

The middle- to long-term prospect of the payment and settlement systems was discussed in our latest "*the Payment and Settlement Systems Report*." The Bank of Japan will continue to make maximum efforts to further improve security and efficiency of Japan's payment and settlement systems.

【Opinions expressed at the following discussion】

- From the technological standpoint, how many hours a day can the new BOJ-NET operate? When the BOJ is going to extend the operating hours, it may be necessary to make the BOJ-Net accessible from overseas, considering that major financial institutions carry out their operations in global basis.
- The BOJ-NET needs to be suspended for a certain time every day to carry out the process for switching the date. Apart from this, it has a flexible system infrastructure that is capable of running almost 24 hours a day. For operations of the BOJ-NET from overseas, there are two options for access: the "computer linkage" that directly links the in-house system of a financial institution to the BOJ-NET; and the "terminal linkage" that allows users to type in transaction data on the terminal. The former is used by financial institutions with a large volume of transactions. For the computer linkage, the system is designed to be set up anywhere in the world that connect to the gateway once a financial institution sets up a gateway computer in Japan for connection with the BOJ-NET. For the terminal linkage, terminals currently only can be set up in Japan. In the "Forum Towards Making Effective Use of the BOJ-NET," some participants argued that the Bank should allow BOJ-NET terminals to be set up overseas. We are aware that, as the operating hours of the BOJ-NET are extended to include night and early morning hours, the key issue will be how to establish the operational procedures on a global basis.
- The process for switching the date is required for payment and settlement systems of central banks overseas as well, and those offering "payment and settlement services for 24 hours a day" actually have the time slot for the switchover process. The BOJ-NET technically has the potential to realize operating hours similar to those of the payment and settlement systems of other central banks.
- The central banks are, broadly speaking, operating with national resources, and in this sense, it is essential to ensure that extension of the operating hours of the payment and settlement systems truly contributes to the economy. The Bank of Japan recently modified the structure of the "Forum Towards Making Effective Use of the BOJ-NET" to enhance the efforts for utilization of the BOJ-NET so that it truly contributes to Japan's economy. We would appreciate it if relevant parties proactively give us their opinions about the effective utilization of the BOJ-Net.

(2) Initiatives towards enhancement of interbank payment system of Japanese Bankers Association (by Mr. Yasuyuki Matsumoto, Japanese Banks' Payment Clearing Network)

(Summary of the presentation)

The Japanese Banks' Payment Clearing Network (Zengin-Net) has been studying ways of operating the Zengin-Net, focusing on extending the operating hours of the Zengin-Net. In so doing, we carried out surveys on the needs of individuals and corporations, and confirmed that there are needs for real-time payments during the night time on weekdays, Saturdays, Sundays and national holidays.

In consideration of the survey results, the Zengin-Net has decided to operate its Interbank Payment System of Japanese Bankers Association on a 24/7 basis and plans to start the new service by the end of 2018. About 90% of the banks have expressed their intention to participate in the system during the newly extended hours ("more-time system," i.e., the system for operating hours except from 8:30AM to 3:30PM on weekdays).

**【Opinions expressed at the following discussion】**

- I believe that there are many cases that overseas systems allow mobile payments utilizing the phone number.
- I think it is up to each financial institution to determine what services to provide to their customers based on the needs of the customers.
- From around 2005, we have provided a payment method called "Pay-easy<sup>5</sup>," which goes well with payments of e-commerce transactions, for fund transfer. However, with the wider use of smartphones, more and more competitors are coming to the market. For example, in the US, there is a smartphone application called "Venmo" that offers fund transfer to friends without fees, which is now very popular. Venmo utilizes the low-cost payment infrastructure ACH to realize the low-cost small-value money transfer. At the same time, compliance (identity verification, or know your customer (KYC)) is handled with the standardized API. It is interesting to note that low-cost, but not necessarily real-time, payment measure is opted for certain purposes.

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<sup>5</sup> In Pay-easy, instead of specifying the bank branch and account number of the transferee, the transferee number, etc. specified in an invoice will be inputted to execute the payment.

- The banking industry is keenly aware that payment measures have been diversified, and that the use of low-cost payment is growing in place of traditional bank transfers. We are studying FinTech and related technologies with a sense of urgency. Initiatives on these technologies are also being advanced in many banks on an individual basis.
- In Kenya, there is a fund transfer service called M-Pesa<sup>6</sup> that allows Vodafone cellphone to transfer funds by using the phone number as well as withdrawal and transfer of legal currencies at Vodafone shops. M-Pesa can also be used for payment at Vodafone shops outside of Kenya. This means that Vodafone has a proprietary clearing system as a telecommunications company, and M-Pesa is one of the new mechanisms for fund settlement. Recently, banks in Kenya are providing services in alliance with M-Pesa. Some other cellphone companies are also tying up with Vodafone for electronic money settlement. Vodafone is said to have 500 million end users globally, and we believe the magnitude of expansion of such new payment services cannot be overestimated.

(3) Issues concerning diversification of funding of foreign currency accompanying globalization of corporate activities (by Mr. Ken Katayama, Nomura Research Institute, Ltd.)

(Summary of the presentation)

As corporate activities become increasingly globalized, companies are facing the need to diversify foreign currency funding measures. Against such a backdrop, the operating hours of the BOJ-NET has been extended, and cross-currency repo may be useful as a measure to fund foreign currencies with Japanese government bonds (JGBs) submitted as collateral.

However, the settlement risk remains if the OTC cross-currency repo is settled on an FOP (free of payment) basis. At present, studies are in progress for implementation of DVP (delivery versus payment) settlement for cross-currency repos between Japan and

<sup>6</sup> The name of the fund transfer system that uses the short message service (SMS) on the cellphone for fund transfer procedures and identity verification. "M" stands for mobile, and "Pesa" means "money" in Swahili. Withdrawal and deposit of money are carried out at M-Pesa agent shops. With M-Pesa, a user wishing to transfer money first makes a deposit to his/her own account at an agent shop. Thereafter, the user transmits the cellphone number of the transferee and the amount of transfer by SMS. The transferee presents the SMS information to a nearby agent shop to receive the money.

Asian countries, and if this settlement mechanism can be extended to the US and European countries, that may help diversify foreign currency funding measures.

**【Opinions expressed at the following discussion】**

(In relation to cross-currency repo)

- Issues on the settlement risk of cross-currency repos is important. I feel that more funds have been brought to ICSD (International Central Securities Depository) in recent years to use its DVP clearing function for settlement. On the other hand, when managing or raising funds through repo transactions with Japanese yen or JGBs as collateral, it is necessary to bring yen or JGBs out of Japan to ICSD. In this case, it is important that the DVP clearing is available for cross-border transactions. The operating hours of the BOJ-NET are currently up to 9 o'clock in the evening, but settlement of JGBs using the BOJ-NET during evening hours is practically limited to FOP. In the future, it may be necessary to enable clearing on a DVP basis during evening hours.
- The "Forum Towards Making Effective Use of the BOJ-NET" has already received the opinion that it will be necessary to enable settlements on a DVP basis during night hours. The Bank of Japan will continue discussing the matter.
- From the aspect of cross-border settlement of JGBs on a DVP basis, if a settlement is to be made in the US dollar, one of the issues will be to which extent the US banks is capable of handling such settlement as the supplier of US-dollar liquidity during evening hours in New York, and discussions with such banks may also be important.
- Currently, financial institutions are preparing for forthcoming margin requirements for OTC derivatives transactions. Particularly, the Japanese financial institutions have a strong need to use cash as collateral, despite legal limitations. Accordingly, there might arise the needs for a further extension of the operating hours of the BOJ-NET to allow for settlement late at night in Tokyo time. In the meantime, due to the low interest rate in Japan at present, Japanese financial institutions have been increasing investment in foreign currency-denominated assets, and this has expanded the demand to raise foreign currency liquidity (through repo transactions). From this viewpoint, there will likely be greater demand to use JGBs as collateral in cross-border transactions. With an increase in non-resident holders of JGBs, foreign financial institutions are asking about the possibility of using JGBs as collateral. One of the practical problems for business corporations to be suppliers of cash is that they are not familiar with GMRA (Global

Master Repurchase Agreement) for repos used in the US and Europe. We are promoting the use of the Clearstream Repurchase Conditions (CRC), which can be used in place of GMRA, to financial institutions as well.

(Use of triparty repo)

- In order to use JGBs as collateral for cross-border transactions, one of the critical limitations in comparison with the US and Europe is, despite the sheer volume of JGBs issued, there are virtually no triparty repos and agents for such repos in Japan.
- Several reasons can be put forward to explain the relative underdevelopment of triparty repos in Japan: the less diverse nature of the securities used as collateral in Japan compared with many overseas markets, a strong tendency for JGBs to be used almost exclusively as collateral, and the lower incidence of collateral substitutions than in overseas markets. These factors make administrative work less complicated than in the US and Europe and financial institutions therefore tend to take care of the administrative work related to settlement and collateral management of JGBs internally, rather than relying on dedicated clearing banks. Nonetheless, if cross-border repo transactions continue to increase in the future, there will likely emerge more complicated deals, and there may arise needs for triparty repos.

(4) Consideration of new technologies in financial infrastructure (JGB Transactions) (by Mr. Taketoshi Mori, Deloitte Touche Tohmatsu LLC)

(Summary of the presentation)

With the blockchain technology, it is possible to build a non-centralized system that is different from the traditional ones, and technologically, such a system is expected to offer real-time and low-cost settlement with improved accuracy in transaction handling and reduced transaction risks.

Nonetheless, in order to apply the blockchain technology to the financial infrastructure, major changes are required in business models and business processes. For example, it is necessary to study compatibility with existing various systems (multi-layered securities clearing systems), exception handling in relation to transaction matching (correction and cancellation of transactions due to double treatment or error in matching), and feasibility of short selling. In carrying out cross-border transactions of JGBs, there will likely be

various issues such as different securities laws in different countries and supervisory power on browsing of the books. In applying the blockchain technology to financial operations, it will be necessary to carry out demonstration experiments with relevant parties.

**【Opinions expressed at the following discussion】**

(Harmonization of blockchain technology and practical operations)

- At present, practical securities operations are basically carried out manually with a large number of fax machines and telephones around, and, as a business person, my frank view is that it would not be easy to apply the blockchain technology to securities businesses. Even if the blockchain is introduced in terms of technology, unless the current practices and systems of securities operations, and even the industry culture, are changed, no major innovations of the overall securities-related operations are likely to be realized. On the other hand, unless there is some cue, the incentives to alter the systems and practices will not be generated. In this sense, it is one of the chicken-and-egg problems. At present, the securities industry is enthusiastic about the new technology, but once the enthusiasm is gone, the key issue will be whether the industry can re-create the systems and practices over the next couple of decades.
- In applying the blockchain technology, it is understandable that the private-type is sought after in consideration of greater efficiency and cost reduction, but this may overshadow the advantages of the public-type. To which extent greater efficiency and cost reduction can be achieved by adopting the private-type will be one of the key points.
- If the private-type blockchain is excessively sought after, it is true that the advantages of the public-type blockchain, such as Bitcoin, may be lost. I think it is sufficient to select the public, private or hybrid types according to the use. My ideal settlement system will be one where all transactions are settled on an RTGS (real-time gross settlement) and DVP basis and central banks cooperate across the border to completely eliminate the settlement risk. This is of course just a vision of the future, but technologically, such a system appears to be feasible with the blockchain technology. I believe the blockchain is a technology with great potential that can be applied to a much wider area than the one currently being discussed.
- Looking at the efforts that have been paid for improvement of efficiency and reduction

of settlement risks and international approach toward the finality on one hand and the new technology of blockchain on the other hand, I believe it is possible to retain the advantages of the former in the core of settlement, while incorporating the advantages of the latter.

- The blockchain is a technology with a huge potential, and I believe it is applicable to retail payments as well as large-value settlements. Nonetheless, I do not think it necessary to replace everything with the blockchain, such as exception handling of securities transactions. (It is conceivable that replacing everything with blockchain would rather make it harder to shorten the settlement cycle.) On the other hand, if all the information on funds and securities are electronically processed on the blockchain, there will be the advantage of shortening the cycle of settlement on a DVP basis.
- In the clearing of securities and funds, the latter represents the "value itself," while the former is based on the "paper metaphor" of "securities." The securities transactions are designed on the assumption of delivery of paper, and computerization of transactions was realized in the form of "omission of paper delivery." However, with the new technology, it may be better to abandon the concepts of "securities" and "paper" and to build an entirely new settlement and distribution mechanism.
- Some overseas entities, such as the Australian Securities Exchange (ASX), are planning to review everything from laws and regulations, rules to market practices with the introduction of the new blockchain technology. When applying the blockchain to financial businesses, due to the rapid advance in technologies, we should bear in mind that the systems and infrastructure should not left behind such technological developments.

(5) Closing Remarks (by Mr. Hiromi Yamaoka, Bank of Japan)

I would like to summarize today's discussions into the following four points.

First, there were discussions on the "positive externality of the network" involving payment and settlement systems. The participants raised a "chicken-and-egg" issue, which means that the network size is simply not large enough for users to enjoy the benefit of "economies of scale" when introducing new payment and settlement services. In order to establish payment and settlement infrastructure that makes full use of innovative technologies and is optimal to the economy, some "kick-starters" might be needed particularly at the initial stage.

Second, in order to improve the security and efficiency of payment and settlement systems and promote innovative payment services, it is important to solve various practical issues arising from conventional market practices, legacy institutional frameworks and underdevelopment of relevant market transactions. In today's discussions, the participants pointed out various practical issues including sub-optimal use of master agreement format, legal uncertainty in cash collateral, underdeveloped triparty repo markets in Japan, and inconsistency between blockchain technology and traditional practices of securities transactions based on telephones and telefax. The Bank of Japan is ready to make its best efforts so as to overcome these issues.

Third, it would be important to strike the appropriate balance between ensuring "room for choice" of various payment instruments and enjoying the benefits of "economies of scale" and "positive externality of network." For example, some participants asked whether all the relevant parties should take coordinated actions also in designing the detail of new payment services, or they should share only the basic common framework while letting each of them design its own supplementary services such as mobile payments. With regard to the "room for choice" of payment instruments, some participants argued that it would be preferable to have options of real-time remittance with higher costs and low-cost non-real-time remittance, rather than forcing all the remittances into a real-time basis. Other participants argued that public-type and private-type blockchains can co-exist and be jointly used in a single system, and that blockchain-based distributed ledgers and traditional centralized ledgers can also co-exist. All of those topics are related to the issue of "room for choice" and "economies of scale" as mentioned earlier. Moreover, this issue might also be relevant to the role of public sector in payment and settlement systems, for some may ask to what extent the public sector should intervene in designing payment and settlement infrastructure, and from where the initiatives of private sector should be fully-exercised.

Lastly, the participants raised the possible conflicts between new technology and traditional institutional framework. Banknotes, paper-based securities and ledgers, which have contributed to the developments of economies and financial transactions as well as efficient settlement systems, were originally based on paper and printing technologies. Accordingly, traditional institutional framework has also been largely based on those technologies. As a consequence, some "digitalized" transactions are still legally illustrated as "paper-based" transactions. For example, in the initial stage of book-entry systems, digitalized and electronic-based transfers of securities were legally explained as "transfers of (physical) possession by instruction" and "constructive transfers with retention of (physical) possession," which were based on the concept of paper-based securities. Some

participants nicely expressed such situation as "paper metaphor." Blockchain and distributed ledger technologies try to enable a system free from an "entrusted third party to manage a centralized ledger." In applying those technologies to various practices, it would be important to examine to what extent the current institutional framework such as legal systems are based on the concept of a "centralized ledger managed by an entrusted third party," and whether we need to modify those traditional framework so as to apply new technologies to the real world.

With the establishment of the FinTech Center, the Bank of Japan will enhance its research and analysis activities as well as public relations regarding financial innovations and relevant new technologies. In order to maximize the benefit of financial innovations, interactive communications with a wide range of economic entities will be critically important, including non-banks and startups. The Bank of Japan is ready to play the role of "catalyst" of those communications, and to make its best possible contribution to the improvement of financial services.

(Appendix 1)

List of Participant Companies and Organizations on March 17

| Name of Company/Organization                       |                                     |
|--|-------------------------------------|
| American Family Life Assurance Company of Columbus | Nippon Biodiesel Fuel               |
| Bicrements   | Nomura Research Institute           |
| bitFlyer   | Norinchukin Bank                    |
| CurrencyPort                                       | NTT Data                            |
| Deloitte Tohmatsu Consulting                       | NTT Data Getronics                  |
| Deloitte Touche Tomatsu                            | Orb                                 |
| DTCC Data Repository (Japan)                       | Pinnacle                            |
| Euroclear Bank                                     | ResuPress                           |
| Financial Services Agency Japan                    | ROYAL GATE                          |
| Fujitsu  | Saison Information Systems          |
| IBM Japan  | salesforce.com                      |
| Japan Securities Clearing Corporation              | SBI Holdings                        |
| Japan Securities Dealers Association               | SBI SECURITIES                      |
| Japan Securities Depository Center                 | SBI Sumishin Net Bank               |
| Japanese Bankers Association                       | Soramitsu                           |
| Japanese Banks' Payment Clearing Network           | Sumitomo Mitsui Banking Corporation |
| KPMG AZSA  | Sumitomo Mitsui Trust Bank          |
| Ministry of Economy, Trade and Industry            | SWIFT Japan                         |
| Mitsui Sumitomo Insurance Company                  | The Bank of Tokyo-Mitsubishi UFJ    |
| Mizuho Financial Group                             | The Risk Data Bank of Japan         |
| Mizuho Information & Research Institute            | Tokyo Financial Exchange            |
| Mizuho Securities                                  | Tokyo Stock Exchange                |
| Monex  | valuedesign                         |
| Moneytree  | Yahoo Japan                         |
| Nihon Unisys                                       |                                     |

(Appendix 2)

List of Participant Companies and Organizations on March 18

| Name of Company/Organization                       |                                     |
|--|-------------------------------------|
| American Family Life Assurance Company of Columbus | Monex                               |
| Bicrements   | Moneytree                           |
| bitFlyer   | Nippon Biodiesel Fuel               |
| Clearstream Banking Japan                          | Nomura Research Institute           |
| CLS  | Norinchukin Bank                    |
| CurrencyPort                                       | NTT Data                            |
| Deloitte Tohmatsu Consulting                       | NTT Data Getronics                  |
| Deloitte Touche Tomatsu                            | Orb                                 |
| densai.net   | ResuPress                           |
| DTCC Data Repository (Japan)                       | ROYAL GATE                          |
| Euroclear Bank                                     | salesforce.com                      |
| Financial Services Agency Japan                    | SBI Sumishin Net Bank               |
| Fujitsu  | Soramitsu                           |
| IBM Japan  | Sumitomo Mitsui Banking Corporation |
| Japan Securities Clearing Corporation              | Sumitomo Mitsui Trust Bank          |
| Japan Securities Dealers Association               | SWIFT Japan                         |
| Japan Securities Depository Center                 | The Bank of Tokyo-Mitsubishi UFJ    |
| Japanese Bankers Association                       | The Master Trust Bank of Japan      |
| Japanese Banks' Payment Clearing Network           | The Risk Data Bank of Japan         |
| JASDEC DVP Clearing                                | Tokyo Financial Exchange            |
| Ministry of Economy, Trade and Industry            | Tokyo Stock Exchange                |
| Mizuho Financial Group                             | Yahoo Japan                         |
| Mizuho Securities                                  |                                     |