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Responses to the Great East Japan Earthquake by Payment and Settlement Systems and Financial Institutions in Japan

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Introduction¹

On Friday, March 11, 2011, a massive earthquake occurred in Japan, with the seismic center off the Sanriku coast in the northeast of the main island of Honshu, about 400 kilometers (250 miles) from Tokyo. With a magnitude of 9.0, the Great East Japan Earthquake was the largest ever recorded in the nation's history. The earthquake and the resulting tsunamis (tidal waves) devastated a vast area and caused a great number of casualties. Large numbers of buildings and facilities were damaged or washed away. Constraints on electric power supply intensified over a wide area, mainly due to the accident at a nuclear power station.

The financial sector in Japan was seriously impacted by the disaster, in terms of both physical damage and indirect effects. Nevertheless, even in the aftermath of the earthquake, the nation's payment and settlement systems and financial institutions,² as well as the Bank of Japan, continued to operate in a stable manner, and managed to maintain their normal functioning as financial infrastructure on the whole. This was largely due to the dedicated efforts of financial institutions in disaster areas to restore their business offices and resume operations to meet the needs of depositors and firms. It also reflected the constant efforts made by payment and settlement systems and financial institutions to put in place robust business continuity arrangements prior to the disaster.

Like electricity, water, gas, telecommunications, railways, and roads, financial services are a key component of the basic lifelines of a society, serving as critical infrastructure that supports people's lives and economic activity. A failure of payment and settlement systems or financial institutions to function effectively could preclude customers from making deposits, cash withdrawals, or payments, thereby intensifying public anxiety in times of disaster. In order to ensure that payment and settlement systems, financial institutions, and financial markets can operate as normally as possible in emergency situations as financial infrastructure supporting economic activity, continuous efforts to enhance business continuity arrangements are essential.

This paper describes the initial responses taken by payment and settlement systems and financial institutions in Japan in the wake of the disaster and how they succeeded in maintaining the functioning of financial infrastructure, focusing primarily on the

¹ This document is an English translation of the Japanese original published on June 24, 2011.

² In this paper, "financial institutions" primarily refers to banks and cooperative financial institutions such as *shinkin* banks.

maintenance of payment and settlement functions. The paper also discusses issues to be addressed in the future to enhance business continuity arrangements.

In response to the disaster, the Bank has taken all possible measures to maintain its functioning as the central bank on numerous fronts, ranging from the smooth provision of cash services to stable operation of its payment and settlement system, the Bank of Japan Financial Network System (BOJ-NET). The Bank will continue to further strengthen its business continuity arrangements. In addition, through its day-to-day monitoring and oversight activities, as well as on-site examinations, the Bank will encourage private-sector payment and settlement systems and financial institutions to strengthen their arrangements and actively support their initiatives to this end.

I. The Great East Japan Earthquake

A. Damage Caused by the Earthquake

The Great East Japan Earthquake struck on Friday, March 11, 2011, at about 2:46 p.m., with its seismic center off the Sanriku coast in northeastern Japan. With a magnitude of 9.0, the earthquake was the largest ever recorded in the nation's history. Following the earthquake, tsunamis hit the Pacific coastline of Japan from Hokkaido, the main northern island in the Japanese archipelago, to Chiba Prefecture near Tokyo in the Kanto region. The earthquake and the resulting tsunamis caused devastation across a wide area. Human casualties were also enormous, with 15,471 persons confirmed dead and 7,472 persons missing as of June 21. Large numbers of buildings and facilities were damaged or washed away.

The earthquake and tsunamis disrupted a broad range of social infrastructure in disaster areas, including electricity, water, gas, telecommunications, railways, and roads. Even in the Tokyo metropolitan area, railways were unable to operate for hours on the day of the earthquake.

In response to the accident at Fukushima Daiichi Nuclear Power Station, the Japanese government by Tuesday, March 15, issued an order to the residents of the area to "evacuate" from the zone within a 20-kilometer (12-mile) radius of the power station, and to "stay indoors" in the zone outside the 20-kilometer radius but within the

30-kilometer (19-mile) radius of the power station.³ Due to the nuclear accident as well as damage to several other power stations, supply of electricity was seriously constrained in the service areas of Tokyo Electric Power Company (TEPCO) and Tohoku Electric Power Company.

B. Effects on Financial Institutions and Payment and Settlement Systems in Japan

Financial institutions in disaster areas were seriously affected by the earthquake and the resulting tsunamis. Their employees suffered heavily, and a large number of their facilities were either destroyed or washed away, forcing them to close their business offices temporarily (as will be described later). Bill and check clearing houses in many areas were also forced to suspend operations due to damage to their facilities or to the offices of participant financial institutions. Despite these difficult circumstances, financial institutions in disaster areas worked hard to restore their offices and cooperated closely with each other, showing great commitment to continue providing financial services to depositors and firms.

According to the Japan Meteorological Agency (JMA), a maximum JMA seismic intensity of "5 upper" was recorded in central Tokyo, affecting the facilities and equipment of some financial institutions located there. On the Friday afternoon that the earthquake occurred, operation of railways in the Tokyo area was disrupted and a large number of employees encountered difficulty in returning home. Between March 14 and April 7, planned blackouts were implemented within the service area of TEPCO due to constraints on the supply of electricity, and some financial institutions were also affected.

³ By the end of April, the zone within the 20-kilometer radius of the power station was designated as a "no-entry zone" (to which entry was forbidden in principle) in addition to the previous "evacuation" designation. For the zones outside the 20-kilometer radius but within the 30-kilometer radius of the power station, an order to "stay indoors" was replaced by new designations: "planned evacuation zones" and "emergency evacuation preparation zones." Residents living in the former were required to evacuate in a planned manner over a period of approximately one month. Residents living in the latter were required to be prepared to evacuate or to stay indoors in the event of an emergency. Both of the zones included some communities beyond the 30-kilometer radius of the power station.

II. The Bank's Responses to the Disaster

A. Establishment of a Disaster Management Team

On Friday, March 11, at 3:00 p.m., approximately 15 minutes after the earthquake occurred, the Bank set up a disaster management team at its Head Office headed by the Governor. The team is responsible for assessing the extent of damage to the Bank's staff and facilities, gathering information on the operational status of the Bank's offices and private-sector financial institutions as well as payment and settlement systems, and deciding the necessary responses. The team also communicates and coordinates with the Japanese government, overseas central banks, and other relevant parties.

B. Provision of Cash Services

1. Supply of cash to financial institutions

To meet the cash needs arising from people's lives and economic activity, the Bank supplies cash -- Bank of Japan notes and coins -- through financial institutions that hold current accounts at the Bank. Once a large-scale disaster occurs, withdrawals of cash by depositors tend to increase because of the need to have cash on hand to pay for daily expenses and heightened anxiety about the future. To prepare for such withdrawals, financial institutions obtain larger amounts of cash than usual from the Bank's Head Office in Tokyo and branches across the country to secure an ample supply of cash on hand.

Because of the magnitude and extent of the damage caused by the Great East Japan Earthquake, financial institutions' requests to the Bank regarding cash supply reached a massive amount. The Bank met these requests in cooperation with the financial institutions. During the weekend immediately following the earthquake -- on Saturday, March 12, and Sunday, March 13 -- the Bank continued providing cash to financial institutions from its branches in Aomori City (Aomori Prefecture), Sendai City (Miyagi Prefecture), and Fukushima City (Fukushima Prefecture), as well as from a custody bank in coordination with the Bank's local office in Morioka City (Iwate Prefecture).⁴ On the following Monday and afterward, financial institutions in the disaster areas continued to increase their supply of cash on hand. The value of cash paid out by the

⁴ For distribution of cash in areas without the Head Office or branches of the Bank in the vicinity, the Bank designates certain offices of financial institutions as custody banks to hold unissued banknotes on its behalf. Receipts and disbursements of banknotes at custody banks are carried out in the presence of the Bank's staff from the Head Office, branches, or local offices.

Bank's branches and local offices in the Tohoku region in northeastern Japan during the first week after the earthquake totaled approximately 310 billion yen, about three times the amount in the same period of the previous year.

On Saturday, March 12, the Bank's Head Office in Tokyo made the special arrangement of opening its windows to provide cash, primarily coins, to financial institutions. This action aimed to address concern about a possible shortage of coins in the Tokyo metropolitan area. The concern arose because between Friday afternoon on March 11 (when the earthquake occurred) and Saturday morning on March 12, there was a surge in the purchase of food, beverages, and other daily necessities at convenience stores and other retail stores, mainly due to the large number of people who encountered difficulty returning home following the disruption of railway operation.

2. Exchange of damaged banknotes and coins

In order to ensure that the use of cash is convenient for the public and the public's confidence in cash is maintained, the Bank exchanges damaged banknotes and coins for clean ones, pursuant to an Ordinance of the Ministry of Finance (damaged banknotes and coins are those that have been soiled or damaged by water, fire, or other means). At the same time, as part of the special financial measures to assist disaster areas (which will be described later), the Bank -- jointly with the Minister for Financial Services -- requested financial institutions to meet the needs of depositors and customers to replace soiled banknotes.

Because the damage caused by the tsunamis was particularly severe, an especially large number of requests were received to exchange water-logged banknotes. There have also been requests to replace cash damaged in fires. As people affected by the disaster have evacuated to places outside the disaster areas, needs to exchange damaged cash are arising not only in the Tohoku region but also at the Bank's Head Office and branches across the country.

The Bank has been doing its utmost to meet the requests to replace damaged cash. Normally, damaged cash is exchanged only at the Bank's Head Office and branches, but following the disaster, in order to provide this exchange service in Iwate Prefecture where the Bank does not have a branch, a special window was opened in Morioka City with the cooperation of a local financial institution. The Bank also sent staff to the branches in the disaster areas to help carry out the exchanges smoothly.

Following the earthquake through June 21, damaged banknotes and coins totaling 2.42 billion yen were brought to the Bank's branches in the Tohoku region and the special window in Morioka City. This figure already far exceeds the value exchanged at the Bank's Kobe Branch in the six months after the Great Hanshin-Awaji Earthquake of 1995, which stood at approximately 0.8 billion yen.

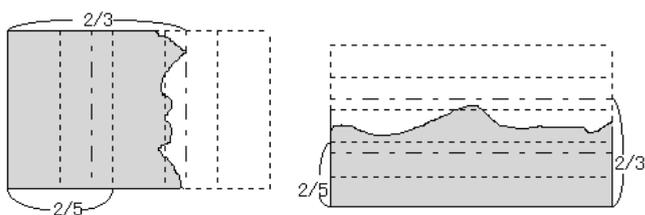
Box 1: Criteria for Exchange of Damaged Banknotes

The Bank replaces damaged banknotes with new banknotes following the criteria below, provided that the two sides of the banknote are maintained.

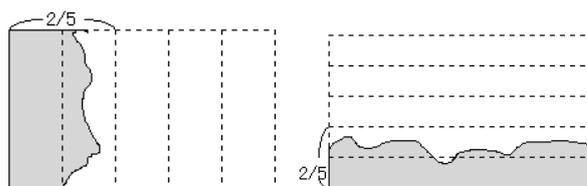
1. A damaged banknote with two-thirds or more of the original remaining is exchanged at **full** face value. For example, a 10,000 yen note is exchanged for 10,000 yen, and a 5,000 yen note is exchanged for 5,000 yen.



2. A damaged banknote with two-fifths or more, but less than two-thirds, of the original remaining is exchanged at **half** face value. For example, a 10,000 yen note is exchanged for 5,000 yen.



3. A damaged banknote with less than two-fifths of the original remaining has no value (exchange is **not** possible).



C. Ensuring Stable Operation of the BOJ-NET

In addition to the issuance of the Bank of Japan notes, the Bank provides funds transfer services to financial institutions that hold current accounts at the Bank (BOJ account holders). Funds transfers are processed through the BOJ-NET, a computer network system operated by the Bank that connects the Bank and its account holders -- either via terminals or by computer-to-computer connection -- and processes the transfers online.

The BOJ-NET is also used for the Bank's services related to Japanese government bonds (JGBs), including settlement, auction, issuance, and collection of payments of JGBs as well as the Bank's market operations. In 2010, the daily average value of transactions processed by the BOJ-NET reached approximately 104 trillion yen for funds transfers and approximately 76 trillion yen for registration and book-entry transfers of JGBs.

The BOJ-NET is at the core of payment and settlement systems in Japan. A disruption in its operations would cause failures in interbank settlement of funds and JGBs, which in turn could have serious adverse impact on people's lives and economic activity. For this reason, the Bank has constantly worked to develop and implement robust business continuity arrangements for the BOJ-NET. In the case of the Great East Japan Earthquake, a JMA seismic intensity of "5 lower" was recorded in the area in Tokyo where the Bank's computer center is located, but the earthquake did not affect the functioning of the BOJ-NET and the system continued stable operation.

D. Request for Special Financial Measures to Assist Disaster Areas

On Friday, March 11, the Minister for Financial Services and the Governor of the Bank of Japan jointly issued a request for financial measures to assist areas affected by the Great East Japan Earthquake.

The request was addressed to financial institutions including banks, *shinkin* banks, and other cooperative financial institutions, as well as securities firms, asking them to take appropriate financial measures to accommodate the needs of those hit by the earthquake.

Specific measures requested to financial institutions included the following:⁵

- (1) To allow withdrawals of deposits upon the verification of the depositor's identity even in cases where deposit certificates or bank passbooks were lost.
- (2) To allow the use of fingerprinting even in cases where a registered seal was not available.
- (3) To grant a grace period for bills that could not be settled because of the disaster before treating them as dishonored bills.
- (4) To exchange soiled banknotes for clean ones.
- (5) To assist customers in the reissuance of lost securities certificates.

In response to the request, financial institutions have taken various measures to flexibly meet the financial needs of their customers (as will be described later).

E. Ensuring Smooth Operation of Treasury Funds and JGB Services

The Bank provides treasury funds services, such as disbursement of public pensions and receipt of national taxes. It also provides JGB services, such as issuance of JGBs and payments of principal and interest on them. These services are provided at the Bank's Head Office and branches, as well as through treasury agents and other agent financial institutions that have been designated by the Bank.⁶

Many of the agent financial institutions located in the Tohoku region were affected by the disaster, and the Bank's provision of treasury funds and JGB services through these institutions became difficult for a while. For example, out of the 40 treasury agents under the jurisdiction of the Bank's Sendai and Fukushima branches, 16, primarily in the coastal areas, were unable to continue business operations at the peak of the crisis.

⁵ On Sunday, March 13, in response to an earthquake in the northern part of Nagano Prefecture, similar joint requests were issued by the Head of the Nagano Local Finance Office of the Kanto Local Finance Bureau and the General Manager of the Matsumoto Branch of the Bank of Japan, and also by the Head of the Niigata Local Finance Office of the Kanto Local Finance Bureau and the General Manager of the Niigata Branch of the Bank of Japan.

⁶ Treasury agents are offices of financial institutions that provide treasury funds and JGB services as agents of the Bank based on contracts with the Bank. Examples of services provided by treasury agents include receipt and disbursement of treasury funds for government agencies, and payment of the principal and interest on JGBs. There are also other types of agent financial institutions, such as "revenue agents," which handle only the collection of government revenues such as national taxes and social security premiums.

Given the fact that payment of treasury funds would normally have reached a monthly peak volume in the week following the earthquake, to ensure the continuation of treasury funds and JGB services, the Bank made arrangements to offer relevant services to the government agencies at the Bank's Head Office and branches, where treasury agents were unable to continue those services.

As facilities of financial institutions were restored, the number of treasury agents unable to continue their operations declined to three by June 21.

F. Accurate and Timely Communication

Following the Great East Japan Earthquake, various rumors spread in parts of the market regarding the status of financial infrastructure in Japan, potentially unnerving overseas investors in particular. This included groundless rumors about the Bank's business arrangements -- for example, that the Bank had switched over its computer center to a backup site in Osaka, and that the Bank had begun to prepare to transfer some of the Head Office functions to Osaka. There were also unfounded concerns about the Tokyo financial market, including that the Tokyo Stock Exchange would be closed. Such incorrect rumors could have further shaken the financial markets, amplifying and intensifying the market anxiety caused by the earthquake. Therefore, it was extremely important to clearly refute these rumors and disseminate accurate information both domestically and internationally.

Since immediately after the earthquake, the Bank, in cooperation with the Financial Services Agency (FSA) in Japan, has gathered information on the extent of damage to and the actions taken by payment and settlement systems as well as financial institutions in Japan, and has worked to provide accurate and timely information for the domestic and overseas markets on the operational status of the Japanese financial infrastructure. Specifically, the Bank made timely releases on the status of business continuity at the Bank and that of settlement of funds and securities, and continued to update the information on its web site for a period of time after the earthquake. At the same time, it sought every opportunity, including international conferences and speeches made at home and abroad, in addition to the use of regular daily communication channels, to disseminate accurate information on the status of Japan's financial infrastructure and developments in the economy.

The experience of the disaster has highlighted anew that information on whether or not the nation's financial infrastructure is operating as usual is a matter of great concern for

financial markets at home and abroad. The continuation of stable functioning of the financial infrastructure is fundamental to people's lives and economic activity. Therefore, it is important to disseminate accurate information regarding the status of financial infrastructure, in addition to enhancing its resilience.

Box 2: The Bank's Measures in Monetary Policy and Other Policy Areas

In addition to the Bank's immediate actions taken to continue the provision of its payment and settlement services, which are described in the text, the Bank has taken various measures in monetary policy and other policy areas in response to the disaster as follows.

1. Ensuring the Stability of Financial Markets

Starting immediately after the earthquake, the Bank provided ample liquidity to financial markets to ensure stability in the markets. When the materialization of a massive risk -- such as a disaster triggered by a large-scale earthquake -- increases uncertainty about the future, market participants aim to secure a large amount of funds on hand to prepare for the worst. If such an increase in precautionary demand for liquidity is left unaddressed, it could destabilize financial markets and eventually adversely affect economic activity. To prevent such a situation, the Bank has supplied an unprecedented level of liquidity since immediately after the earthquake, and has been striving to ensure financial market stability by reassuring market participants in terms of funding.

On Monday, March 14, the first business day after the earthquake, the Bank offered funds totaling 21.8 trillion yen through funds-supplying operations. This reached a record high in terms of daily offer and was equivalent to nearly three times the maximum daily liquidity offered during the financial crisis after the failure of Lehman Brothers in autumn 2008. The Bank continued to provide ample liquidity after March 14, and on Thursday, March 24, the outstanding balance of current accounts at the Bank reached a record high of 42.6 trillion yen.

On Friday, March 18, the Group of Seven (G7) finance ministers and central bank governors held a telephone conference, whereby the authorities of the United States, the United Kingdom, and Canada as well as the European Central Bank agreed to join

Japan in concerted intervention in foreign exchange markets in response to the movements in the yen's exchange rate in the wake of the earthquake. Based on this agreement, foreign exchange interventions were carried out on the same day. At the same time, the Bank released the following statement by the Governor: "The Bank of Japan strongly expects that Japan's concerted action with G7 member countries in the foreign exchange market will contribute to the stable formation of foreign exchange rates."

2. Enhancing Monetary Easing

On Monday, March 14, the first business day after the earthquake, the Bank held a Monetary Policy Meeting (MPM). Although the meeting had originally been scheduled to be held over two days, it was shortened to one day, as it was judged that -- in order to ensure stability in public sentiment and financial markets -- it was important for the Bank to examine the effects of the earthquake on Japan's economic and financial developments, as well as swiftly make public the decision on its monetary policy stance. Based on the examination, the Bank decided to further enhance monetary easing.

Specifically, under the framework of comprehensive monetary easing, which was implemented in October 2010, the Bank decided to increase the amount of the Asset Purchase Program by about 5 trillion yen to about 40 trillion yen in total, mainly by increasing the purchases of risk assets such as CP, corporate bonds, exchange-traded funds (ETFs), and Japan real estate investment trusts (J-REITs). The decision was made with a view to preempting a deterioration in business sentiment and discouraging an increase in risk aversion in financial markets from adversely affecting economic activity.

3. Supporting Financial Institutions in the Disaster Areas

At its MPM held on April 28, the Bank decided to introduce the funds-supplying operation to support financial institutions in disaster areas. The decision was based on the judgment that it was necessary for the Bank to support financial institutions in the disaster areas in their initial efforts to meet demand for funds for restoration and rebuilding, from a very early phase before such demand increased further.

Eligible counterparties for the funds-supplying operation are financial institutions with business offices in disaster areas that conduct lending. The total amount of loans was

set at 1 trillion yen, and the duration of each loan is one year with a loan rate of 0.1 percent per annum.

At the same MPM, the Policy Board decided to ease the Bank's collateral eligibility standards for debt of companies and municipal governments in disaster areas, with a view to securing sufficient financing capacity of financial institutions in disaster areas.

4. Adjusting the Bank's On-Site Examinations

The Bank conducts on-site examinations of financial institutions' business operations and the state of the property by visiting their premises as stipulated in contracts with the institutions.

In its fiscal 2011 on-site examinations, the Bank has decided to give the utmost consideration to the effects of the disaster on financial institutions' business operations. For example, the Bank has decided to suspend examinations that had been planned for April in the case of institutions whose business operations were likely to have been severely affected by the disaster or the planned blackouts. In addition, given the magnitude of the damage caused by the earthquake, in examining the creditworthiness of affected borrowers, the Bank has been duly taking into consideration the difficulties faced by financial institutions in assessing the current conditions of borrowers and the length of time required for their recovery.

III. The Private Sector's Responses to the Disaster

A. Responses of Financial Institutions and Payment and Settlement Systems in Disaster Areas

1. Supply of cash to affected depositors

The earthquake and the resulting tsunamis damaged or destroyed many offices of financial institutions, especially those in areas along the Pacific coast of the Tohoku region and part of the Kanto region. Many automated teller machines (ATMs) also stopped operating. Moreover, additional offices of financial institutions were closed following the evacuation order in response to the accident at Fukushima Daiichi Nuclear Power Station. Of the total of about 2,700 offices of the 72 financial institutions headquartered in one of the six prefectures of the Tohoku region or Ibaraki Prefecture in the Kanto region, approximately 310 -- or 11 percent of the total -- were closed as of

March 16 (Chart 1).

Since immediately after the earthquake, financial institutions in disaster areas have worked hard to restore their offices and resume their operations, despite the fact that they were also affected by the disaster. Thanks to their efforts, by June 21 the number of closed offices had dropped to 72, or approximately 3 percent of the total of about 2,700 offices.

Chart 1: Number of Closed Offices of Financial Institutions

March 16 (Wed.)	March 28 (Mon.)	April 4 (Mon.)	May 2 (Mon.)	June 21 (Tues.)
Approx. 310 (approx. 11%)	Approx. 170 (approx. 6%)	Approx. 150 (approx. 6%)	97 (3.6%)	72 (2.7%)

Note: Figures in parentheses indicate the percentage of closed offices among the total of about 2,700 offices of the 72 financial institutions headquartered in one of the six prefectures in the Tohoku region or Ibaraki Prefecture in the Kanto region.

Source: Financial Services Agency.

Meanwhile, financial institutions in the disaster areas made every effort to meet the needs of depositors and borrowers. For example, to take over the operations of those offices that were judged difficult to restore, they opened temporary windows or offices in nearby areas or transferred businesses to neighboring offices. On Saturday, March 12, and Sunday, March 13 -- the weekend immediately after the earthquake -- many financial institutions opened windows at offices that were still available to respond to cash withdrawals and other requests from depositors. In the days that followed, financial institutions in disaster areas continued to assist affected customers by, for example, reissuing certificates of deposits and ATM cards, and responding to requests and questions concerning loans and inheritance.

In addition, based on the authorities' requests put forward in the above-mentioned special financial measures to assist disaster areas, financial institutions have been dealing flexibly with the affected depositors, for example, by allowing withdrawals of deposits upon confirming the depositor's identity in cases where deposit certificates or passbooks have been lost. Similarly, depositors have been allowed to make withdrawals through the use of fingerprinting in cases where the registered seal has been lost, upon verifying the depositor's identity. Damaged banknotes and coins -- for example, those that were waterlogged or burned -- have been brought into financial

institutions, where they were examined and exchanged for clean cash or forwarded to the Bank's Head Office or branches.

In sum, the functioning of financial infrastructure in the disaster areas has been maintained through the dedicated efforts of the financial institutions. As described above, the Bank has been making its utmost efforts to support the smooth business operation of these financial institutions by working closely with them.

2. Coordination and cooperation among financial institutions

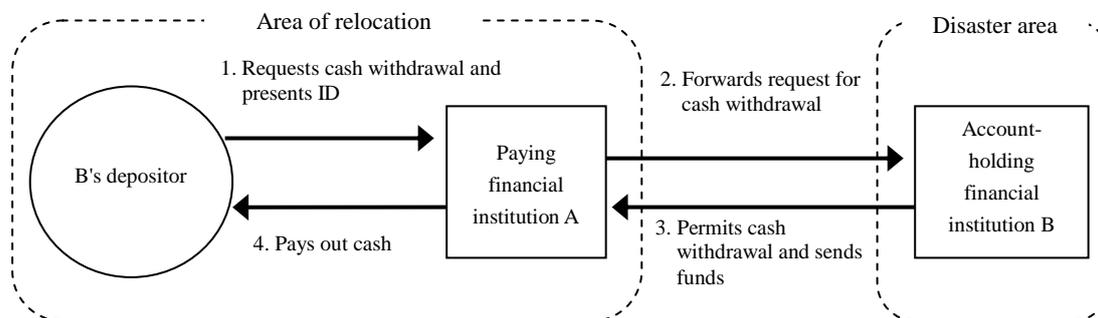
A prominent feature of the responses made to the disaster is that financial institutions across the nation have worked in close coordination and cooperation to better meet the needs of those affected by the disaster.

Some financial institutions in the disaster areas needed to obtain additional cash on hand to respond to the increase in deposit withdrawals. Since these financial institutions themselves had been affected seriously by the disaster, financial institutions in the neighboring areas cooperated to deliver cash to them. There were also cases in which neighboring financial institutions, as an emergency measure, shared the use of cash-delivery cars to ensure the uninterrupted distribution of cash. In other instances, neighboring financial institutions worked together to transport account information and other documents necessary for continuing business operations at the affected offices.

Many disaster victims have evacuated to places far from their homes, and in their areas of relocation some of them have been unable to find offices of the local financial institutions where they kept deposits. In order to help these relocated customers, financial institutions have worked together to make arrangements allowing withdrawals of deposits through the windows of financial institutions even when customers lack an account. This is done as follows: (1) the paying financial institution verifies the customer's identity at its windows; (2) it contacts the account-holding financial institution where the customer has a deposit; and (3) it makes payments to the customer on behalf of the account-holding financial institution within an agreed limit (Chart 2).

Such coordination and cooperation among financial institutions have contributed significantly to maintaining the functioning of the overall financial infrastructure in Japan despite the emergency situation resulting from the unprecedented disaster.

Chart 2: Interbank Arrangement for Cash Withdrawal in the Area of Relocation



Source: Japanese Bankers Association.

3. Measures taken by bill and check clearing houses

As part of the mechanism of the bill and check clearing systems, bills and checks written by firms are brought into local clearing houses by participant financial institutions for clearing, and net positions of these institutions are settled at designated settlement banks. Clearing houses are located throughout Japan, and major ones are operated by the regional bankers' associations. At bill and check clearing houses operated by regional bankers' associations in the cities where the Bank's Head Office or branches are located, the net positions are settled using the current accounts of the bankers' associations held at the Bank. As of March 11, 2011, there were 73 bill and check clearing houses in the six prefectures of the Tohoku region.⁷

The operations of bill and check clearing houses were significantly affected by the Great East Japan Earthquake. The earthquake and the resulting tsunamis damaged the facilities of some clearing houses, rendering them inoperative. Offices of participant financial institutions were also severely damaged, making it difficult for them to physically deliver bills and checks to the clearing houses. In some cases, clearing operations were suspended temporarily to assess the impact of evacuation orders and other developments in response to the accident at the nuclear power station.

Under these circumstances, many bill and check clearing houses in the disaster areas were forced to close immediately after the earthquake. In the four prefectures of Aomori, Iwate, Miyagi, and Fukushima, a total of 29 such clearing houses, or about 50 percent of the total in these prefectures, were closed as of March 14 -- the first business

⁷ The numbers of bill and check clearing houses in the text and the chart hereafter refer only to those operated by regional bankers' associations.

day after the earthquake. However, thanks to the restoration efforts of the clearing houses and their participant financial institutions, by June 21 the number of closed clearing houses had declined to three (Chart 3).⁸

During this period, major bill and check clearing houses in the prefectures of Iwate, Miyagi, and Fukushima took an emergency measure by assuming the operations of those that had closed. Specifically, until the closed clearing houses were able to resume operations, major operating clearing houses expanded their areas of coverage, so that participant financial institutions could bring in the bills and checks that normally would be processed by the affected, closed clearing houses (Chart 4). While temporary suspension of clearing services of bills and checks could not be avoided, these measures were taken to resume clearing services as early as possible, thereby stabilizing financial and economic activity in the disaster areas.

Chart 3: Number of Closed Bill and Check Clearing Houses

	Aomori Prefecture (14)	Iwate Prefecture (12)	Miyagi Prefecture (13)	Fukushima Prefecture (17)	Total (56)
March 14 (Mon.)	14	4	7	4	29
March 15 (Tues.)	0	4	6	6	16
March 16 (Wed.)	0	4	5	7	16
March 17 (Thurs.)	0	4	5	7	16
March 18 (Fri.)	0	4	4	7	15
End of March	0	4	3	3	10
End of April	0	3	2	3	8
End of May	0	2	2	2	6
June 21 (Tues.)	0	0	1	2	3

Note: Figures in parentheses indicate the total number of bill and check clearing houses in each prefecture.

⁸ Since the Rikuzentakata Clearing House in Iwate Prefecture had no prospect of being able to resume operation, it was shut down permanently on June 3. From June 6 onward, clearing services for the areas it served have been provided by the neighboring Ofunato Clearing House.

systems operated by the private sector also maintained stable operations.

Some financial institutions, however, experienced disruptions in their internal computer systems and were unable to send instructions to payment and settlement systems through normal means of computer-to-computer connection. To complete settlement operations, these institutions used alternative means of connectivity via terminals that had been put in place in advance. Some financial institutions temporarily evacuated their staff from their offices immediately after the earthquake, but were able to complete operations by utilizing their backup offices, for example.

As a result of these efforts, even on the day of the earthquake, funds and securities transfers over the BOJ-NET were completed at the normal scheduled times, that is, at 4:15 p.m. for settlement of net positions arising from the major interbank clearing system, the Zengin System,⁹ and by 7:00 p.m. for all funds transfers. Most of the major payment and settlement systems operated by the private sector also completed settlements more or less at normal hours. The Japan Securities Depository Center (JASDEC), the central securities depository for stocks and other securities, extended the cut-off time for free-of-payment (FOP) transfer of investment trusts by one hour, from 5:00 p.m. to 6:00 p.m., in response to processing delays at some participant financial institutions.

Some financial institutions in disaster areas faced difficulty in continuing retail credit transfer operations due to damages to their headquarters or branches. Given this situation, the Zengin System restricted access to its system for eleven participant financial institutions (six *shinkin* banks and five credit associations) in disaster areas in order to prevent credit transfer instructions from being sent to these institutions by other financial institutions. All access restrictions were removed by March 30, as these institutions restored facilities and other capabilities necessary to resume credit transfer operations.

In disaster areas, there were also cases where the headquarters of cooperative financial

⁹ The Zengin System, operated by the Japanese Banks' Payment Clearing Network (Zengin-Net), is an interbank clearing system for domestic retail credit transfers. It is a deferred net settlement (DNS) system, which centrally processes the exchange of transfer instructions among participants between 8:30 a.m. and 3:30 p.m., with participants' net positions settled over the BOJ-NET at 4:15 p.m. On high-volume days (e.g., the last business day of each month and of each quarter), transfer instructions are exchanged between 7:30 a.m. and 4:30 p.m., with net positions settled at 5:15 p.m. From autumn 2011, the settlement method for large-value payments (defined as payments equal to or larger than 100 million yen) in the Zengin System is scheduled to change from the current DNS to real-time gross settlement (RTGS).

institutions were damaged or washed away. These institutions, however, did not suffer the loss of data, as basic data on deposits, loans, and other services were processed and managed by shared data centers operated by the central organization of these cooperatives and its affiliate.

As described above, payment and settlement systems as well as financial institutions across Japan generally continued to operate stably. There were also procedures and systems in place to effectively address the temporary inability of affected financial institutions to participate in payment and settlement systems. All of these reflected the steady efforts made by relevant parties prior to the disaster, such as strengthening the earthquake resistance of the relevant facilities and developing procedures and systems that enable them to respond flexibly to emergency situations.

The extensiveness of the damage caused by the disaster highlighted the importance of enhancing back-up arrangements for computer systems and headquarters functions. As the experience at some cooperative financial institutions in disaster areas shows, it is also important to maintain back-up data on deposits, loans, credit transfers, and other core services of financial institutions at distant locations.

2. System failure at a major bank and extension of Zengin System operating hours

During the night of Monday, March 14, a system failure occurred at a major bank, which resulted in a significant buildup of unsettled credit transfers, both in terms of volume and value, in the days that followed. According to a report by a third-party investigation committee established by the bank, it was unable to send a total of about 1.2 million outgoing credit transfer instructions that were scheduled to be settled between Tuesday, March 15, and Wednesday, March 23. The bank also failed to process some 1.01 million incoming credit transfer instructions it received from other banks with a value date between Wednesday, March 16, and Friday, March 18. While the system failure was not directly caused by the earthquake or tsunamis, it was reportedly triggered by a concentration of large numbers of donation payments to particular accounts at this bank, with subsequent errors in rectification measures magnifying the scale of the problem.

As a result of the system failure, the bank's submission of transfer instructions to the Zengin System was significantly delayed. On Tuesday, March 15, and Wednesday, March 16, the Zengin System responded to the situation by extending cut-off and

settlement times by one hour. Accordingly, the BOJ-NET extended its cut-off times by one hour. For about one week from Friday, March 18, the operating hours of the Zengin System and the BOJ-NET were once again extended by one hour (Chart 5).¹⁰ These extensions were made to provide additional time for submission of transfer instructions because the impact of the system failure at the major bank had spread to other financial institutions, increasing their operational workloads at their offices.¹¹ High volume of transfer instructions was also expected during this period of the month due to concentration of salary and commercial payments.¹²

Chart 5: Extension of Operating Hours at the Zengin System and the BOJ-NET

Date	Extension	Event
March 11 (Fri.)	Not implemented	Earthquake occurred at around 2:46 p.m.
March 14 (Mon.)	Implemented	Planned blackouts by TEPCO started. Transportation capacity was reduced in the Tokyo metropolitan area.
March 15 (Tues.)	Implemented	Processing of credit transfers was delayed due to a system failure at a major bank.
March 16 (Wed.)	Implemented	
March 17 (Thurs.)	Not implemented	
March 18 (Fri.)	Implemented	High volume of transfer instructions was expected due to salary and commercial payments.
March 22 (Tues.)	Implemented	High volume of transfer instructions was expected toward the fiscal year-end.
March 23 (Wed.)	Implemented	
March 24 (Thurs.)	Implemented	
March 25 (Fri.)	Implemented	High volume of transfer instructions was expected due to salary payments.

¹⁰ The Zengin System and the BOJ-NET extended their operating hours by one hour also on Monday, March 14, the first business day following the disaster. This decision aimed to address the possible impact of the planned blackouts by TEPCO that started on this day. With reduced public transportation capacity in the Tokyo metropolitan area due to the blackout, there was a possibility that participant financial institutions would face difficulty in securing sufficient staff on the day. Extension was implemented also to ensure a response to unexpected incidents resulting from the blackout, including a system failure, that might affect operations at participant financial institutions.

¹¹ Following the system failure, the bank restricted the use of ATM and other services from Friday, March 18, through Tuesday, March 22, which included a three-day weekend, to restore systems by March 22. As a result, the processing of all unsettled outgoing and incoming credit transfers was completed by Thursday, March 24.

¹² In Japan, payments between firms are concentrated on the days that are the multiples of 5 each month (the 5th, 10th, 15th, 20th, 25th, and 30th).

Reference: Settlement/Cut-Off Times after One-Hour Extension

System	Operations	Standard settlement/ cut-off times	Extended settlement/ cut-off times
Zengin System	Sending and receipt of transfer instructions	3:30 p.m.	4:30 p.m.
BOJ-NET	Settlement of Zengin System net positions	4:15 p.m.	5:15 p.m.
	JGB transfers	4:30 p.m.	5:30 p.m.
	Funds transfers (end-of-day simultaneous processing)	5:00 p.m.	6:00 p.m.
	Funds transfers (for participants with access to later hours) ¹³	7:00 p.m.	No extension (7:00 p.m.)

The extension of operating hours by the Zengin System and the BOJ-NET aimed to maintain the functioning of the financial infrastructure by completing settlement of payments handled by these systems -- which play a key role in people's lives and economic activity -- as much as possible on the scheduled settlement day.

3. Market-wide business continuity arrangements

In the money market, the foreign exchange market, and the securities market, participants have developed market-wide business continuity arrangements, with the aim of maintaining networks of market participants in the event of a disaster. In each market, trade associations (the Japanese Bankers Association, Tokyo Foreign Exchange Market Committee, and Japan Securities Dealers Association, respectively) act as secretariats and maintain dedicated web sites that can be used to gather information and recommend changes to market practices in the event of a disaster.

At a little after 3:00 p.m. on March 11 -- shortly after the Great East Japan Earthquake occurred -- the secretariat of each market asked participants in the business continuity arrangement to report their operational status, including whether they were able to continue trading and settlement operations. In response, each participant reported the relevant information to the dedicated web site, and the information was then shared among other participants. After confirming that the major market infrastructure and financial institutions continued to operate as normal, it was judged that there was no

¹³ To help reduce foreign exchange settlement risk, the BOJ-NET allows BOJ account holders to make funds transfers up to 7:00 p.m. for those that have requested routine access to later hours. In principle, BOJ-NET funds transfers close at 7:00 p.m. even on days on which extensions are made to the settlement of Zengin System net positions and end-of-day simultaneous processing.

need for further action such as recommending changes in market practices. On the morning of Monday, March 14, when TEPCO's planned blackout started and reduced the capacity of the public transportation system in the Tokyo metropolitan area, the web sites were used again to confirm that the major market infrastructure and financial institutions maintained normal functioning.

As discussed above, the framework of information sharing via dedicated web sites, as part of market-wide business continuity arrangements, functioned smoothly following the earthquake, demonstrating the framework's effectiveness. The usefulness of such a framework was recognized especially because immediately after the earthquake telephone services were temporarily disrupted even in the Tokyo metropolitan area, where the facilities of the major market infrastructure and financial institutions were concentrated.

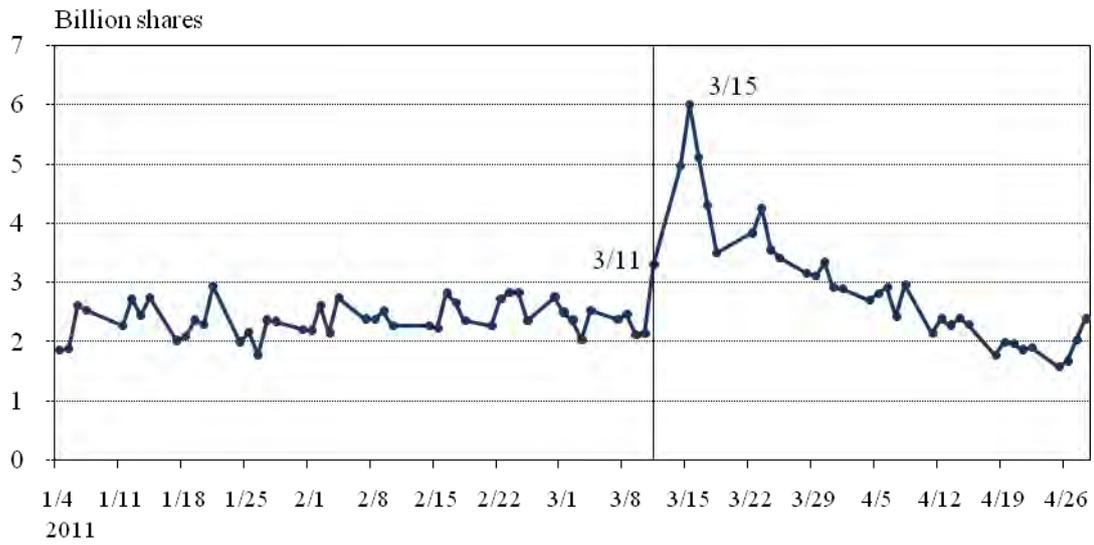
4. Responses to surges in trading activity in stock markets

A surge in trading activity is often observed in financial markets immediately following a major event, such as a natural disaster or a failure of a financial institution. For example, the bankruptcy of Lehman Brothers in autumn 2008 was followed by a sharp increase in foreign exchange market activity.

Following the Great East Japan Earthquake, trading volume increased significantly in the Japanese stock market. On Friday, March 11, following the earthquake that occurred at around 2:46 p.m., cash trading of stocks soared in the last quarter-hour of the afternoon session, which closed at 3:00 p.m. Trading levels remained high in the cash and index options markets of stocks for approximately two weeks from Monday, March 14. On Tuesday, March 15, the cash stock trading volume on the First Section of the Tokyo Stock Exchange marked a record high of approximately 6 billion shares (Chart 6). The volume of Nikkei 225 options (put options) traded on the Osaka Securities Exchange also marked a record high of approximately 560 thousand contracts on Monday, March 14 (Chart 7).

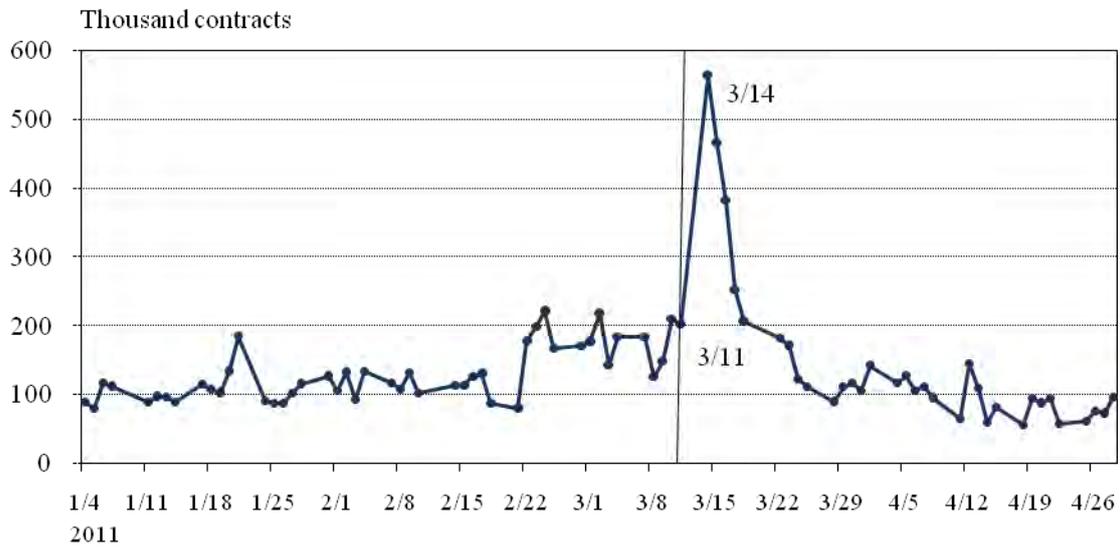
Securities exchanges as well as payment and settlement systems are expected to have sufficient operational capacity to cope with such sudden and sharp increases in trading activity. With a high level of operational capacity, the market infrastructure in Japan was able to provide smooth and uninterrupted processing despite the surge in trading volume following the earthquake.

Chart 6: Trading Volume on the First Section of the Tokyo Stock Exchange



Source: Tokyo Stock Exchange.

Chart 7: Trading Volume of Nikkei 225 Options (Put Options)



Source: Osaka Securities Exchange.

5. Responses to blackouts in disaster areas and planned blackouts in TEPCO service areas

Immediately following the earthquake, blackouts occurred over virtually the entire Tohoku region. On Friday, March 11, the day of the earthquake, financial institutions in the region, including the four branches of the Bank, continued operations by using in-house power generators. On Saturday, March 12, and Sunday, March 13, many financial institutions continued to rely on in-house power generators while opening some of their offices to assist depositors. The supply of electricity was restored in some larger cities, including the prefectural capitals, toward the evening of March 13, allowing many financial institutions to operate using commercial electricity from March 14 onward.

As the supply and distribution chain for fuel was temporarily impaired immediately after the earthquake, some financial institutions faced concerns about obtaining additional fuel for their in-house power generators in a timely manner. Nevertheless, these institutions were able to obtain the necessary amount of fuel with the support of neighboring financial institutions and to continue their operations.

Meanwhile, within the service area of TEPCO, planned blackouts were implemented from Monday, March 14.¹⁴ The TEPCO service area was divided into five segments, with rotational blackouts planned in sequence. Some financial institutions were based in areas subject to the planned blackouts, and others were based in areas that were exempted from such blackouts, including certain parts of Tokyo's 23 wards. Financial institutions with facilities in areas subject to the blackout continued normal operations at their headquarters, system centers, and major branches by using in-house power generators during the blackout periods. Meanwhile, branches and ATMs without in-house power generators were closed during blackouts. Moreover, as part of efforts to reduce the use of electricity, some financial institutions voluntarily closed or shortened the operating hours of ATMs located outside their offices.

In the first few days of the planned blackouts, there were delays and sudden changes in the schedule of public transportation services in the Tokyo metropolitan area. Financial institutions sought to maintain normal operations under such circumstances by arranging accommodations for critical staff near workplaces and by encouraging staff to

¹⁴ Tohoku Electric Power Company had announced that it would also carry out planned blackouts in its service area, except for the areas that had been seriously affected by the disaster. However, the blackouts were not implemented as the supply and demand balance turned out to be less tight than expected.

report to work earlier than usual. Payment and settlement systems operated by the private sector took similar measures to maintain stable operations. As a result of these efforts, the smooth functioning of the financial infrastructure in Japan was maintained on the whole.

TEPCO ended the planned blackouts in early April as the supply and demand balance of electricity improved. However, there is a concern that TEPCO and Tohoku Electric Power Company would again face constraints in electricity supply during the summer, when demand for electricity is expected to increase. The Japanese government has announced that planned blackouts will not be implemented in principle, while asking firms -- large- and small-scale consumers of electricity -- as well as households to reduce the use of electricity by 15 percent compared with the previous year.¹⁵ Payment and settlement systems and financial institutions are working to make specific plans to meet the reduction target while maintaining their normal services to the largest extent possible.^{16,17}

IV. Conclusion

A. Overall Assessment of the Responses to the Disaster

Like electricity, water, gas, telecommunications, railways, and roads, financial services are a key component of the basic lifelines of a society, serving as critical infrastructure supporting people's lives and economic activity. A failure of payment and settlement systems or financial institutions to function effectively could preclude customers from making deposits, cash withdrawals, or payments, thereby intensifying public anxiety in times of disaster. In order to ensure that payment and settlement systems, financial institutions, and financial markets can operate as normally as possible in emergency situations as financial infrastructure supporting economic activity, continuous efforts to enhance business continuity arrangements are essential.

As described above, payment and settlement systems and financial institutions in Japan

¹⁵ Based on Article 27 of the Electricity Business Act, restrictions on the use of electricity will be applied to firms that are large-scale consumers of electricity during the summer of 2011. Such customers are required to keep their electricity consumption during peak hours to a level that is 15 percent less than the maximum level used in the same period of the previous year.

¹⁶ The Bank released its plans for reducing electricity usage during the summer on June 15, 2011 (available only in Japanese).

¹⁷ In the regions other than the service areas of TEPCO and Tohoku Electric Power Company, electricity companies are also asking customers to reduce electricity usage throughout the summer of 2011.

continued to operate stably even in the wake of the unprecedented disaster, and succeeded in maintaining smooth provision of financial services. This was largely due to the dedicated efforts of financial institutions in disaster areas that worked hard to restore their business offices and resume operations to meet the needs of depositors and firms, even though they had also been affected by the disaster. It also reflected the constant efforts made by payment and settlement systems and financial institutions to put in place robust business continuity arrangements prior to the disaster. The Bank appreciates the great efforts and commitment shown by the financial industry to date and hopes that the steady efforts to maintain smooth functioning of the financial infrastructure will continue.

B. Issues for Future Work

Based on the experience of the recent disaster, the Bank has identified three issues for future work related to business continuity management at payment and settlement systems and financial institutions in Japan. It should be noted that many of the measures taken in response to the disaster remain in progress, and the following is based on the current provisional assessment.

First, payment and settlement systems and financial institutions need to review the severity and scope of the scenarios used in designing their business continuity arrangements, to see whether they sufficiently address potential stress events in light of the recent disaster. Business continuity arrangements are typically developed based on damage scenarios that may include constraints on the availability of (1) facilities and equipment such as headquarters, offices, and computer centers; (2) infrastructure such as electricity, water, and gas; and (3) human resources such as the management and employees. Specific arrangements are then designed to address each scenario. In the recent disaster, the earthquake and the resulting tsunamis caused an unprecedented level of devastation over a wide area. Electricity supply was constrained for an extended period, and transportation services were disrupted for a number of hours. Trading activity in some segments of the financial markets surged temporarily. The impact of the disaster was especially severe as various disruptions and constraints occurred simultaneously across a wide area. In light of this, both the central and local governments have begun to review their damage scenarios to see whether they sufficiently reflect the potential effects of anticipated earthquakes and tsunamis. It is important for payment and settlement systems as well as financial institutions to ensure that their scenarios sufficiently address potential stress events by taking into account the

lessons drawn from the disaster.

Second, it is crucial to enhance business continuity arrangements in line with the identified scenarios. The severity of damage caused by the earthquake and the resulting tsunamis spurred a renewed recognition of the importance of enhancing back-up arrangements for computer systems and headquarters functions. In addition, the disaster highlighted the importance of (1) increasing in-house power generating capabilities against potential long-term constraints on electricity supply, (2) enhancing arrangements for securing necessary staff in the event of prolonged disruption of public transportation services, and (3) securing system processing capacity to withstand a surge in trading activity. To minimize loss of data on deposits, loans, credit transfers, and other core services of financial institutions, it is also necessary to maintain back-up data at distant locations.

Third, implementing and enhancing "street-wide exercises," with participation of the overall financial industry, eventually with the cooperation of nonfinancial firms such as the providers of social infrastructure, would be effective in ensuring consistency of arrangements across institutions. While tests at the level of individual financial institutions are an essential part of their business continuity management, such tests are not necessarily sufficient to maintain the functioning of the overall financial infrastructure. For example, while business continuity arrangements may call for employees to work at home and remotely access IT facilities from home in emergency situations, it is an open question whether the telecommunications capacity would be sufficient to handle the high concentration of traffic caused by a number of financial institutions taking similar actions simultaneously. In order to address such issues, street-wide exercises are performed on a regular basis in some countries, based on a predefined scenario involving financial institutions as well as a range of other relevant entities such as telecommunications carriers and public transportation service providers. In Japan, the first street-wide exercise was conducted in the autumn of 2010, organized by the Japanese Bankers Association. Almost all banks in Japan participated, testing the efficacy of business continuity arrangements against the pandemic spread of the H1N1 influenza. In 2010, a joint test of market-wide business continuity arrangements -- involving the money market, securities market, and foreign exchange market -- was also conducted under a scenario of the occurrence of an earthquake in Tokyo. This was effective in strengthening coordination between the three markets. Further enhancement of these testing programs and expansion of participants are important going forward.

In sum, while payment and settlement systems and financial institutions in Japan succeeded in maintaining their functions and supporting people's lives and economic activity in the wake of the unprecedented disaster, there remain issues to be addressed to further strengthen their resilience. Such continuous review and evaluation of the plan in light of new events and threats is a process inherent in business continuity management.

As the sole issuer of banknotes and the operator of the BOJ-NET, the Bank will continue to further enhance its business continuity arrangements. In addition, through its day-to-day monitoring and oversight activities, as well as its on-site examinations, the Bank will encourage private-sector payment and settlement systems and financial institutions to strengthen their arrangements, and actively support their initiatives to this end.