BOJ Reports & Research Papers

Payment and Settlement Systems Report 2007-2008

Payment and Settlement Systems Department

Bank of Japan

Introduction

The Payment and Settlement Systems Report provides an overview of developments in payment and settlement systems in Japan and identifies challenges to be addressed in the future. The report comprises three main points of focus.

(1) Description of trends in transaction volume and value and progress in reform of Japan's payment and settlement systems

(2) Identification of room for improvements that can be made to enhance safety and efficiency of Japan's payment and settlement systems, and explanation of how system operators and the Bank of Japan are addressing them

(3) Introduction of the Bank's work on payment and settlement systems with the aim of contributing to worldwide research on payment and settlement issues

This report covers developments in the period from early 2007 to the fall of 2008. During this period, there was a significant increase in payment and settlement activity in Japan, reflecting changes in monetary policy by the Bank and the global financial markets turmoil stemming from the subprime mortgage problem in the United States. Despite such challenges, payment and settlement systems have continued to function in a stable manner. In particular, while the filing for bankruptcy by Lehman Brothers Japan (LBJ) resulted in large scale of settlement fails in both the spot and futures transactions in the bond and stock markets, closing of LBJ's outstanding positions and rebuilding of positions by LBJ's counterparties were executed without significant delays in accordance with the rules of individual central counterparties and agreements between market participants.

The global financial markets remain to be under considerable stress, with increasing interdependencies among payment and settlement systems at home and abroad. In light of these circumstances, it has become increasingly important that the Bank pursue its efforts in enhancing safety and efficiency of Japan's payment and settlement systems while closely monitoring developments in other countries.

In Japan, steady progress is being seen in the next-generation RTGS (RTGS-XG) project of the BOJ-NET Funds Transfer System and the project for the dematerialization of stocks in the securities settlement area. There are also ongoing initiatives for the enhancement of

business continuity planning.

Turning to developments overseas, in Europe, a number of projects aimed at enhancing and integrating payment and settlement systems is proceeding. In the United States and the United Kingdom, the recent upheavals in the global financial markets have led to discussions on development of a more formalized framework for central bank oversight of payment and settlement systems.

As the central bank of Japan, the Bank will continue to work in close coordination with relevant parties including operators of payment and settlement systems, financial institutions participating in those systems and other central banks to further enhance safety and efficiency of payment and settlement systems.

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Executive Summary[1]

Developments in Payment and Settlement Systems

The value and volume of transactions processed by major payment and settlement systems in Japan increased substantially in 2006 and 2007 and maintained high levels during the first half of 2008. This reflected changes to the Bank's guidelines for money market operations and rises in market interest rates since March 2006, as well as the moderate expansion of the economy that continued until early 2008. The consequent increase in economic and financial activity resulted in the growth of payment and settlement activity.

Despite such challenges, payment and settlement systems operated by the Bank and the private sector have continued to function in a stable manner. In particular, while the filing for bankruptcy by Lehman Brothers Japan (LBJ) resulted in large scale of settlement fails in both the spot and futures transactions in the bond and stock markets, closing of LBJ's outstanding positions and rebuilding of positions by LBJ's counterparties were executed without significant delays in accordance with the rules of individual central counterparties and agreements between market participants.

Key Improvements and Issues for Further Work

1. Next-Generation RTGS Project

In October 2008, the Bank went live with Phase 1 of the next-generation RTGS project of the BOJ-NET Funds Transfer System (BOJ-NET). The next-generation RTGS project is designed to bring new levels of efficiency and safety to large-value payments in Japan by: (1) introducing liquidity-saving features (LSF) to real-time gross settlement (RTGS) processing in BOJ-NET and (2) incorporating large-value payments currently processed on a deferred net settlement (DNS) basis in the Foreign Exchange Yen Clearing System (FXYCS) and the Zengin System into BOJ-NET. In Phase 1, LSF were introduced in BOJ-NET and FXYCS payments were incorporated into BOJ-NET.

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[1] This document is an English translation of the *Payment and Settlement Systems Report 2007-2008* originally published in Japanese on October 28, 2008. The English version does not contain chapters on developments in electronic money and developments in other countries. On electronic money, see *Recent Developments in Electronic Money in Japan* (October 2008), which can be obtained via the Bank website (http://www.boj.or.jp/en/).

Large-value Zengin payments will migrate to BOJ-NET in the latter half of 2011 as Phase 2. When this is achieved, large-value payments will in principle be processed on an RTGS basis, providing additional stability and efficiency for Japan's payment system. It is therefore vital that preparations continue to move forward for implementation of Phase 2.

2. Developments in Securities Settlement Systems

A private-sector securities settlement system is preparing for full dematerialization of stocks, scheduled for implementation in January 2009. When this is achieved, Japan will be one of only a handful of countries that have achieved the full dematerialization of securities. The Bank expects that the relevant parties will complete their final preparations so that the system gets off to a smooth start[2].

The bankruptcy of Lehman Brothers Holdings and the following turmoil in the global financial markets have further raised awareness of the importance of reducing settlement risk. There are a number of issues to be addressed from this perspective, including reviews and enhancements of risk management mechanisms in individual securities settlement systems and shortening of the settlement cycle for Japanese Government Bond (JGB) transactions (i.e., achievement of T+1 settlement).

The Bank has conducted and published in November 2007 a self-assessment of the JGB settlement system's compliance with the "Recommendations for Securities Settlement Systems" issued by the Committee on Payment and Settlement Systems (CPSS) of the central banks of the Group of Ten countries and the Technical Committee of the International Organization of Securities Commissions (IOSCO). Similar efforts have been made by some private-sector payment and settlement systems. It is desirable that more payment and settlement systems conduct and publish self-assessments in the future.

3. Enhancements to Business Continuity

During recent years, the Bank has focused on establishing and improving arrangements for the alternative operational site as part of its efforts to enhance business continuity. In the private-sector, market participants have been putting in place market-wide emergency

[2] The dematerialization of securities has started in January 2009 without any major problems.

planning for the money market, securities market and foreign exchange market. From the view point of strengthening the overall resilience of Japan's payment and settlement systems, financial markets, and financial institutions, a possible future work would include the implementation of street-wide exercises.

4. Growth of Electronic Money

At of the end of March 2008, the total number of cards issued by the six major chip-based electronic money service providers totaled more than 80 million, with total value outstanding reaching JPY 77.1 billion. During fiscal 2007, the value and volume of transactions settled using those cards also increased to JPY563.6 billion and 810 million, respectively, reflecting introduction of multiple new services.

The value of electronic money issued and used remains rather small compared with more traditional retail payment instruments such as cash. However, given the rate of increase in usage and the growing number of merchants at which these instruments are accepted, it can be said that electronic money is gradually gaining ground among the retail payment instruments. It is worthwhile to observe how electronic money will evolve in the future in a competitive environment in terms of safety, efficiency, and convenience.

Developments in Other Countries

In Europe, there are a number of ongoing projects that are designed to integrate, harmonize and enhance payment and settlement systems. In the area of payment systems, the TARGET2 system was launched in a phased manner during November 2007 and May 2008, offering more advanced functions and services. The Eurosystem is proceeding with a project to set up TARGET2-Securities to provide securities settlement services for private sector systems, with a scheduled launch in 2013. In the United States and the United Kingdom, the recent upheavals in the global financial markets have led to proposals for development of a more formalized framework for central bank oversight of payment and settlement systems.

The growing interdependencies among domestic and foreign payment and settlement systems raise the potential for shocks in specific regions to be spread quickly across a wide range of countries. In light of the continuing turmoil in the global financial markets, it has

become increasingly important that the Bank pursue its work on enhancing safety and efficiency of Japan's payment and settlement systems while closely monitoring developments in other countries. As the central bank of Japan, the Bank will continue to work in close coordination with relevant parties including operators of payment and settlement systems, financial institutions participating in the those systems and other central banks.

Part 1: Developments in Major Payment and Settlement Systems

Chapter I: Payment and Settlement Activity

This chapter summarizes recent activity in major payment and settlement systems in Japan.[1] The value and volume of transactions processed by major payment and settlement systems increased substantially in 2006 and 2007 and maintained high levels during the first half of 2008. This reflected changes to the Bank of Japan's guidelines for money market operations and rises in market interest rates since March 2006, as well as the moderate expansion of the economy that continued until early 2008. The consequent increase in economic and financial activity resulted in the growth of payment and settlement activity.

A. Payment Systems

1. BOJ-NET Funds Transfer System

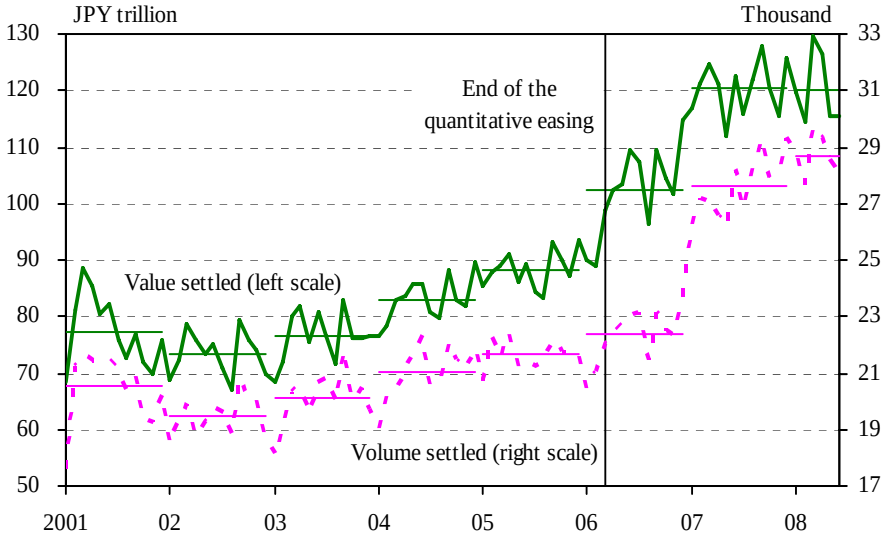
The accounts that financial institutions hold with the Bank are used to settle call money transactions, the cash legs of Japanese Government Bond (JGB) and other securities transactions, and net positions arising from private-sector deferred net settlement (DNS) systems. Those funds transfers are processed by the BOJ-NET Funds Transfer System (BOJ-NET), the real-time gross settlement (RTGS) system operated by the Bank.

The daily average value and volume settled in BOJ-NET began to grow at a faster pace in 2006, recording a substantial year-on-year increase of roughly 20 percent in 2007 (Chart 1-1). The same high levels of activity were maintained in the first half of 2008. The trends reflected changes to the Bank's guidelines for money market operations and rises in market interest rates since March 2006, as well as the moderate expansion of the economy that lasted through the beginning of 2008.

Chart 1-2 shows the breakdown of the value of payments settled in the BOJ-NET for 2007 by the type of transaction. It shows that a substantial portion of the increases came from the cash legs of JGB transactions (delivery-versus-payment (DVP) for JGBs). Other positive contributions came from interbank payments such as those arising from call money transactions and from payments resulting from the Foreign Exchange Yen Clearing System (FXYCS).

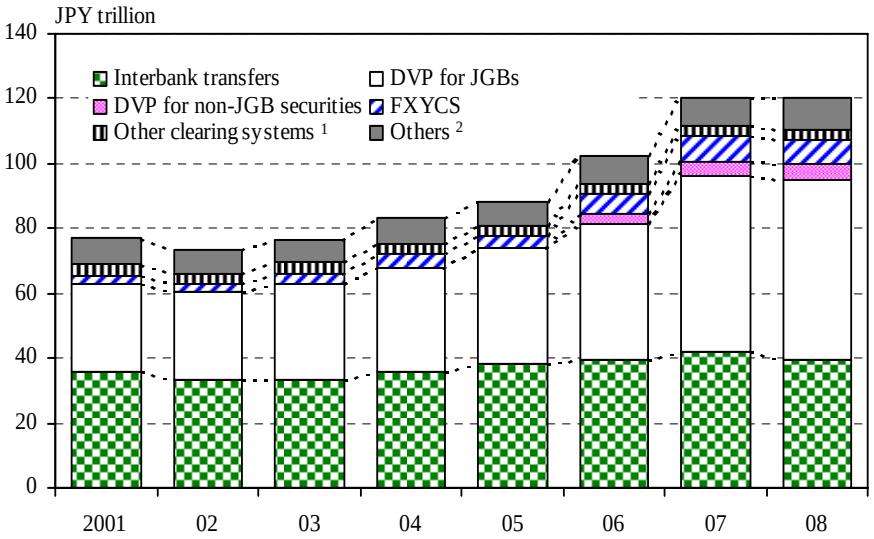
[1] The figures for 2008 are for the period between January 4, 2008 and June 30, 2008.

Chart 1-1:
Average Daily Value and Volume of Payments Settled in the BOJ-NET Funds Transfer System



Source: Bank of Japan.

Chart 1-2:
Average Daily Value of Payments Settled in the BOJ-NET Funds Transfer System by the Type of Transaction



Notes: 1. Net positions arising from the Zengin Data Telecommunication System (Zengin System), bill and check clearing systems, and the Tokyo Financial Exchange (TFX).
2. Includes payments to and from the Bank of Japan.

Source: Bank of Japan.

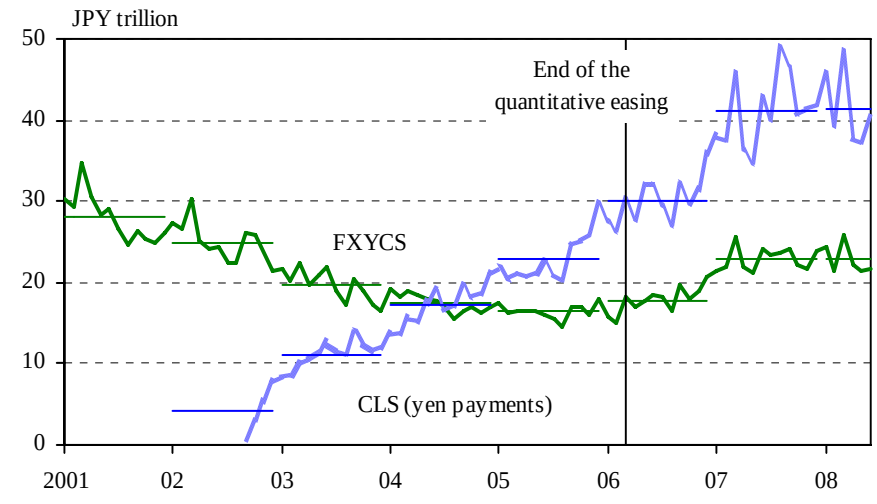
2. Payment Systems Operated by the Private Sector

a. FXYCS and CLS

Cross-border yen payments are processed primarily by FXYCS and the Continuous Linked Settlement (CLS) system. FXYCS is operated by the Tokyo Bankers Association (TBA) and processes yen payments resulting from foreign exchange transactions, transactions in the euroyen market, and cross-border retail transfers. CLS, operated by CLS Bank in New York, is a multicurrency payment system that settles the two legs of a foreign exchange transaction on a payment-versus-payment (PVP) basis.

The value of payments processed by FXYCS had been in decline since 2002 with the shift of CLS-eligible transactions to CLS, but in 2006 recorded a small increase for the first time in five years (Chart 1-3). During 2007, the value processed by FXYCS increased substantially. This can be attributed to increases in international trade transactions and foreign exchange transactions under the moderate expansion of the economy, as well as increased activity in the euroyen market reflecting domestic financial conditions. Meanwhile, yen payments processed by CLS also recorded higher growth in 2007 due to substantial increases in foreign exchange transactions. The primary factor behind this was the increase in foreign exchange market volatility amidst the turmoil triggered by the U.S. subprime mortgage problem. During the first half of 2008, both systems maintained the same high levels of activity as the previous year.

Chart 1-3:
Average Daily Value of Payments Processed by FXYCS and CLS



Sources: TBA; CLS.

With the go live of Phase 1 of the next-generation RTGS project on October 14, 2008, the DNS mode of FXYCS was abolished and all FXYCS payments moved to RTGS processing in BOJ-NET (see Part 2, Chapter I, section A).

BOX 1-1:
Progress in Reducing Foreign Exchange Settlement Risk

Foreign exchange settlement risk refers to the risk that one party to a foreign exchange trade pays the currency it sold but does not receive the currency it bought because of insolvency of the counterparty. In 1996, the Committee on Payment and Settlement Systems (CPSS) of the central banks of the Group of Ten countries published a long-term strategy for reducing systemic risk arising from the settlement of foreign exchange transactions, which included actions to be taken by individual banks and industry groups.

One of the most important outcomes of these efforts was the startup of CLS settlement in 2002. CLS is a multicurrency payment system established by leading financial institutions from around the world to address the central bank strategy. CLS provides a mechanism for virtually eliminating foreign exchange settlement risk by employing a PVP approach which ensures that a final transfer of one currency occurs if and only if a final transfer of the other currency takes place.

In light of the growing use of CLS, in April 2006, CPSS conducted a survey to assess the progress made in reducing foreign exchange settlement risk. Some 109 financial institutions participated in the survey and together they were selected to cover more than 80 percent of the foreign exchange market in 15 currency areas. The results of the survey were published in May 2008 in a report titled "Progress in reducing foreign exchange settlement risk."

The survey results showed that CLS was used to settle 55 percent of the foreign exchange settlement obligations for the total of 15 CLS-eligible currencies and 62 percent for the Japanese yen, indicating that considerable progress had been made in reducing foreign exchange settlement exposures.

However, the results also showed that settlement methods that entail foreign exchange settlement risk, such as traditional correspondent banking, still account for more than 30 percent of the total surveyed obligations. Moreover, estimates based on the survey findings

indicated that the largest bilateral counterparty exposure at some financial institutions was in excess of 10 percent of the total capital.

Chart B1-1-1:
Percentage of FX obligations settled by method

	CLS	Traditional correspondent banking	Bilateral netting (effect)	Other settlement methods
Total (15 currencies)	55%	32%	8%	5%
Japanese yen	62%	24%	8%	6%

One of the key ways to manage foreign exchange settlement risk is to set counterparty limits and measure settlement exposure against those limits in the same way as other short-term credit extensions. The survey found that, while 77 percent of the surveyed institutions had appropriate risk management procedures in place, 63 percent underestimated their exposures and had room for improvement. Results also suggested that at some institutions there are insufficient internal incentives to select settlement methods that were effective in reducing settlement risk.

In light of the key survey findings, CPSS has recommended further actions to be taken to reduce remaining exposures and address a risk of reversing progress that has been already made. As part of the recommended actions by central banks, CPSS will work in cooperation with the Basel Committee on Banking Supervision to explore options that could ensure that individual financial institutions apply appropriate risk management procedures to their foreign exchange settlement exposures.

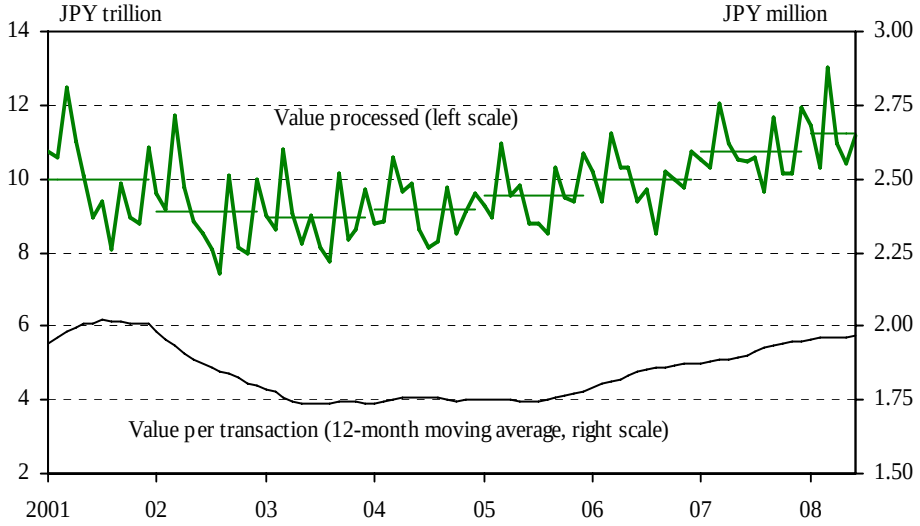
b. Zengin Data Telecommunication System

The Zengin Data Telecommunication System (Zengin System), operated by the Tokyo Bankers Association (TBA), is an interbank clearing system for domestic retail credit transfers. The Zengin System has recorded steady increases in value since 2003, reflecting a moderate expansion of the domestic economy (Chart 1-4). The value per transaction continues to rise since 2006.

c. Bill and Check Clearing Systems (Tokyo Clearing House)

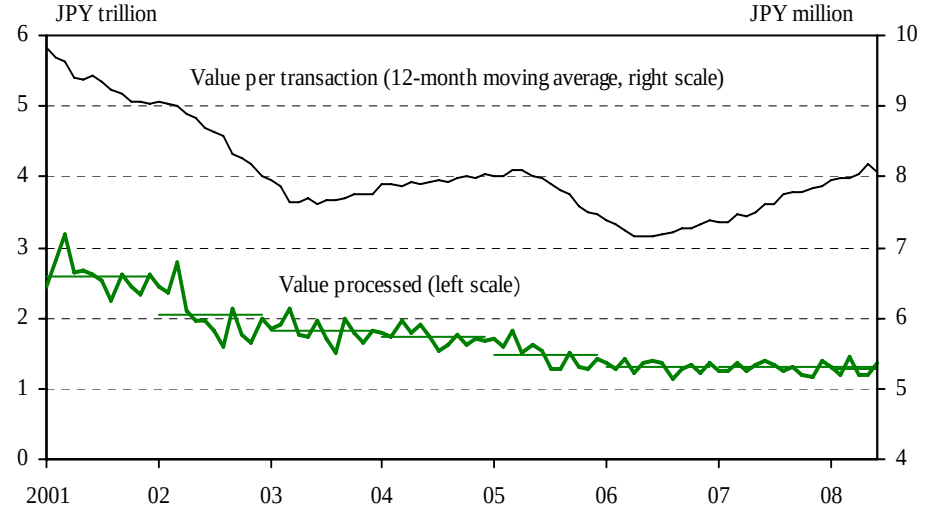
The Tokyo Clearing House (TCH) handles approximately 70 percent of the bills and checks cleared nationwide. There is a long-term shift away from bills and checks to credit transfers by businesses, with a view to avoiding the cost of stamp tax and the cost of handling paper-based bills/checks. As a result, the daily average value processed by TCH continues to decline year on year, though the pace of decline has slowed down since 2007 (Chart 1-5). Like the Zengin System, there has been a steady increase in the value per transaction since 2006.

Chart 1-4:
Average Daily Value of Payments and Value per Transaction Processed by the Zengin System



Source: TBA.

Chart 1-5:
Average Daily Value of Payments and Value per Transaction processed by TCH



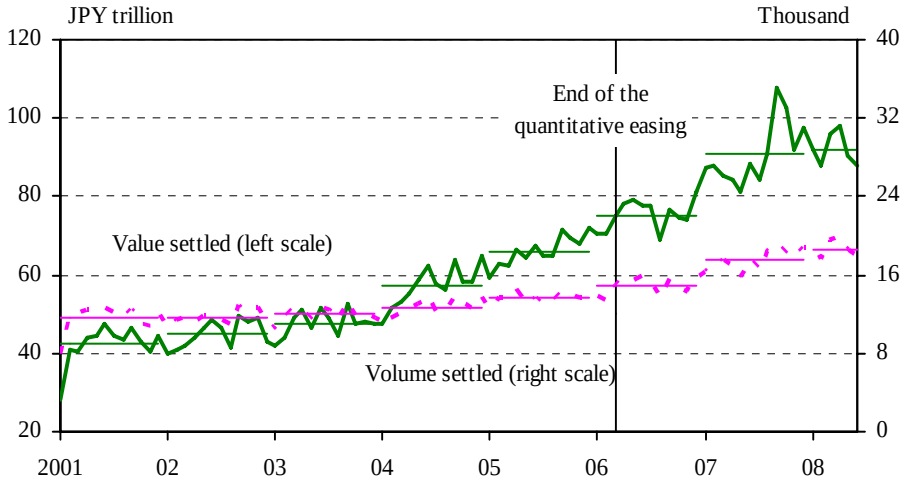
Source: TBA.

B. Securities Settlement Systems

1. BOJ-NET JGB Services

Settlement via the BOJ-NET JGB Services (the total value and volume of JGBs processed by the JGB Book-Entry System and the JGB Registration System) has increased substantially since 2007 in spite of the growth of netting effect rendered by the Japan Government Bond Clearing Corporation (JGBCC) (Chart 1-6). This has primarily been due to increases in the issuance of JGB and the reactivation of outright and repo transactions of JGB after the end of the quantitative monetary easing policy (QMEP).

Chart 1-6:
Average Daily Value and Volume of JGBs Processed by the BOJ-NET JGB Services[1]



Note: 1. The total value (face value) and volume processed by the JGB Book-Entry System and the JGB Registration System.
Source: Bank of Japan.

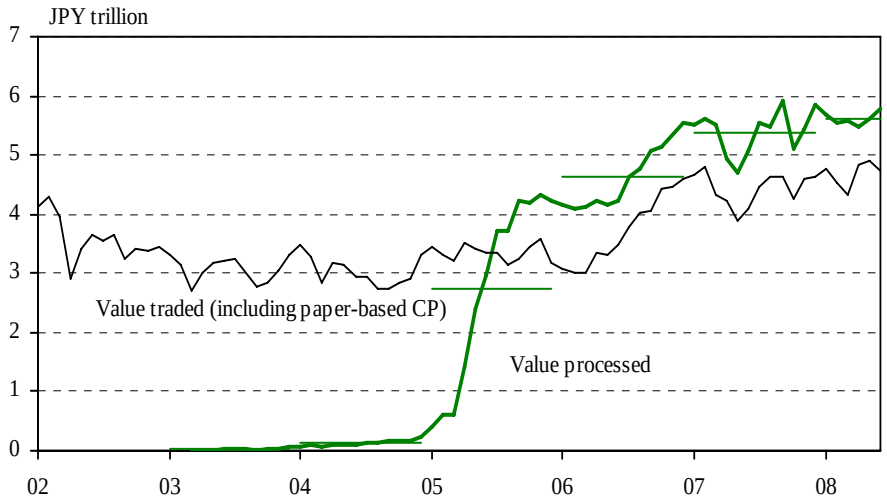
The share of JGB transactions processed through JGBCC (face value basis)[2] has continued to expand and reached nearly 40 percent in 2007. During 2007, the daily average value of JGB transactions settled was approximately JPY 90 trillion, and without netting effect of JGBCC, the total value would have been approximately JPY 120 trillion, an indication of the efficiency gains achieved by JGBCC's clearing services.

[2] For estimation purposes, total JGB transactions were considered to be the aggregate of transactions settled via BOJ-NET JGB Services without going through JGBCC and transactions accepted and cleared through JGBCC.

2. Securities Settlement Systems Operated by the Private Sector

The Japan Securities Depository Center (JASDEC) is a central securities depository that operates book-entry systems for corporate and other bonds, dematerialized CP, stocks, and investment trusts. The value and volume of dematerialized CP processed by JASDEC increased substantially after the conversion from paper-based CP to dematerialized CP in 2005 (Chart 1-7). Settlement of dematerialized CP continued to grow, reflecting increases in the issuance of CP combined with greater activity on the repo (*gensaki)* market, and produced a year-on-year increase of 15 percent for both settlement value (face value) and volume during 2007. The rate has slowed somewhat in 2008, but growth continues.

Chart 1-7:
Average Daily Value of Dematerialized CP Processed by JASDEC



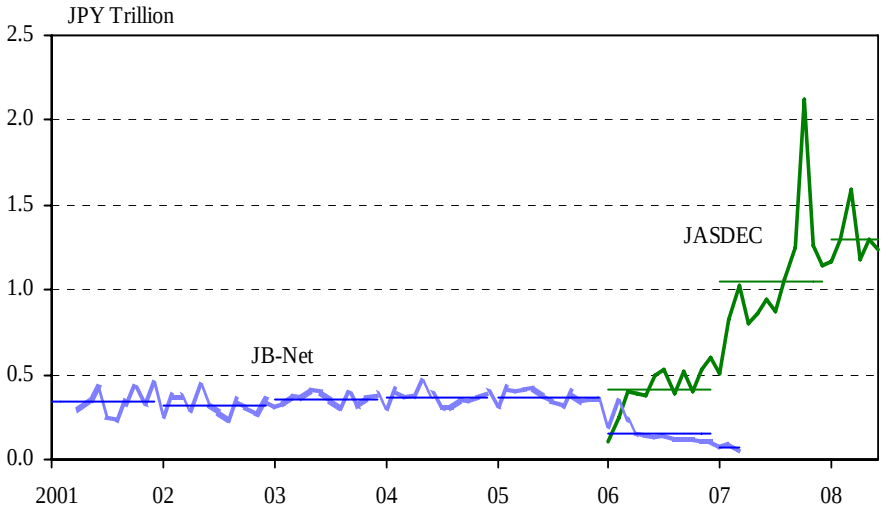
Sources: JASDEC; Japan Securities Dealers Association (JSDA).

During 2007, the value (face value) and volume of corporate and other bonds processed by JASDEC increased by 2.5 times (Chart 1-8). The primary factors in this were the higher level of issuance together with the migration of existing registered bonds to the new JASDEC book-entry transfer system, in preparation for the abolition of tax-relief measures relating to registered bond implemented in January 2008.[3] During 2008, there has been further year-on-year growth in settlement value (face value) and volume, reflecting an

[3] Beginning January 6, 2008, various types of tax relief measures (exemption of tax on interest income from government and other bonds held by public corporations, exemption from taxable income under the small savings tax-exemption system, and exemption from withholding taxes on interest income from government and other bonds held by financial institutions designated in the Special Taxation Measures Law) only apply to book-entry bonds.

increase in transfers and redemptions of the corporate and other bonds in the new JASDEC book-entry transfer system. The Japan Bond Settlement Network (JB-Net) was an online network system that linked participants and registrars for the settlement of registered bonds. The system ceased operations on April 27, 2007, with the completion of the migration of existing registered bonds to the JASDEC book-entry transfer system.

Chart 1-8:
Average Daily Value of Corporate and Other Bonds Processed by JASDEC and JB-Net



Sources: JASDEC; JB-Net.

The Japan Securities Clearing Corporation (JSCC) provides clearing services for stocks and convertible bonds traded at the six stock exchanges in Japan[4] (exchange trades), while the JASDEC DVP Clearing Corporation (JDCC) provides clearing services for non-exchange trades of stocks and convertible bonds. Net positions calculated at JSCC and JDCC are settled at JASDEC acting as central securities depository.

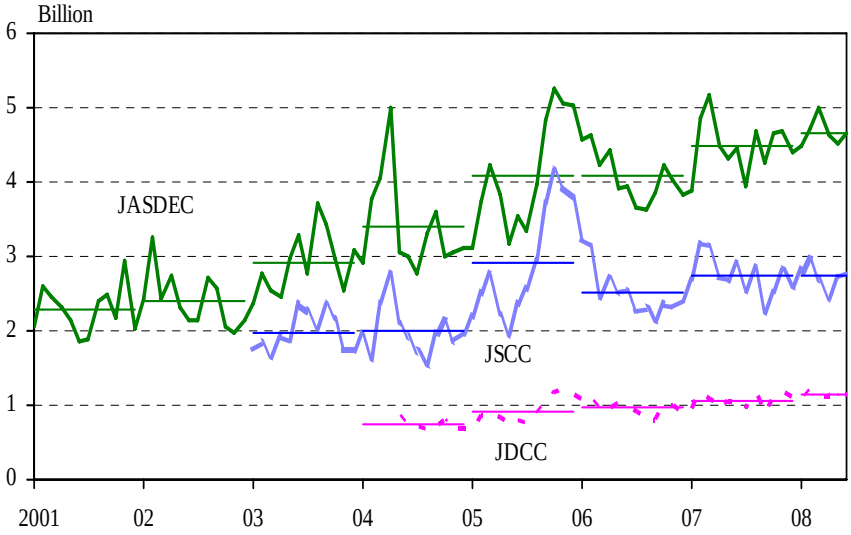
During 2007, these institutions recorded a year-on-year increase of 10 percent in their clearing and settlement volumes, as a result of an increase in stock trading due to the moderate expansion of the economy (Chart 1-9).

Turning to the settlement of investment trusts, JASDEC began operations of a book-entry

[4] The six securities exchanges are Tokyo Stock Exchange, Osaka Securities Exchange, Sapporo Securities Exchange, Nagoya Stock Exchange, Fukuoka Stock Exchange, and Jasdaq Securities Exchange.

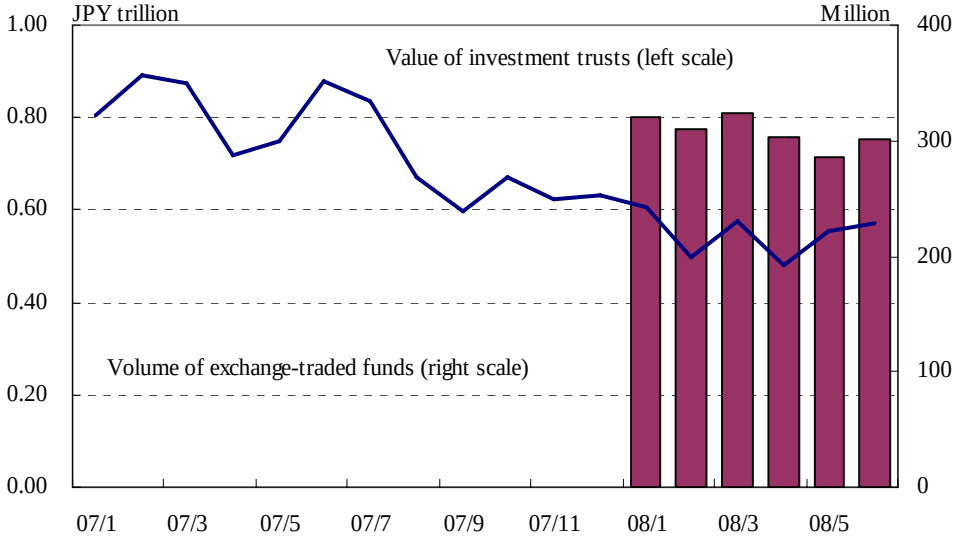
transfer system in January 2007 with coverage of all investment trusts other than exchange traded funds (ETFs). The system expanded its coverage to ETFs in January 2008, achieving complete dematerialization of all types of investment trusts (see Part 2, Chapter II, section C). It should be noted, however, that settlement value and volume have posted year-on-year declines during 2008 due to sluggish sales performance (Chart 1-10).

Chart 1-9:
Average Daily Volume of Stocks Processed by JASDEC, JSCC, and JDCC



Note: 1. JASDEC settles stock transactions cleared by JSCC (exchange trades) and JDCC (non-exchange trades).
Sources: JASDEC; JSCC; JDCC.

Chart 1-10:
Average Daily Value and Volume of Investment Trusts Processed by JASDEC



Note: 1. The volume of exchange-traded funds refers to the number of funds transfers (includes exchange trades and non-exchange trades).
Source: JASDEC.

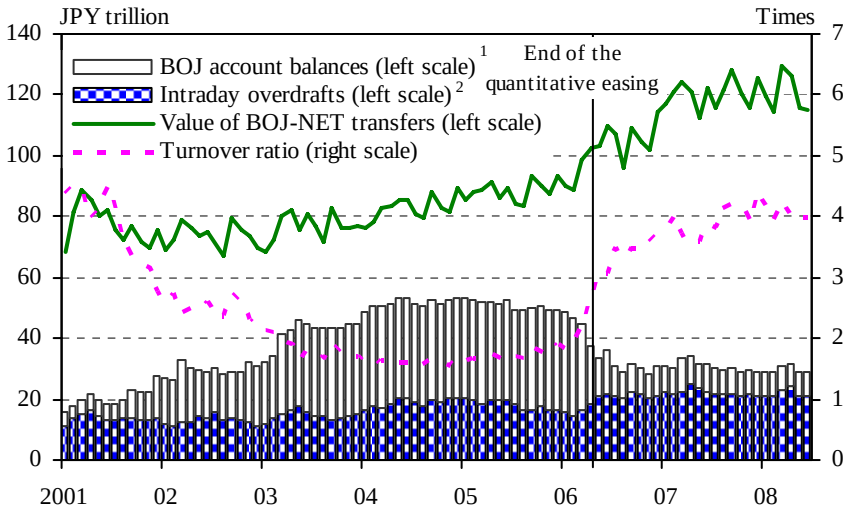
Chapter II: Risks in Payment and Settlement Systems

Based on the trends in payment and settlement activity described in Chapter I, this chapter examines key issues in individual systems, including timing of settlement in RTGS systems, risk management in DNS systems, and operational reliability.

A. BOJ-NET Funds Transfer System and BOJ-NET JGB Services

Financial institutions utilize overnight balances held at BOJ accounts and intraday overdrafts provided by the Bank to fund liquidity needed for settlement. The amount of overnight balances on BOJ accounts reached a peak in excess of JPY 30 trillion under QMEP, but with the end of QMEP in March 2006, it dropped significantly to JPY 7 trillion, which was the level of the total amount of required reserves (Chart 1-11). During the same period, the amount of intraday overdrafts has seen only a slight increase. In total, the amount of available balances (i.e., sum of overnight balances and intraday overdrafts) after March 2006 is JPY 30 trillion or about 60 percent of the levels seen under QMEP. As noted in Chapter I, the daily average value of payments processed in the BOJ-NET Funds Transfer System increased during this period. As a result, the turnover ratio, which is calculated as the ratio of the total value settled to the total amount of liquidity in the system, has risen sharply immediately after the end of QMEP to the same level as that at January 2001, i.e., when BOJ-NET Funds Transfer System was converted to RTGS from DNS.

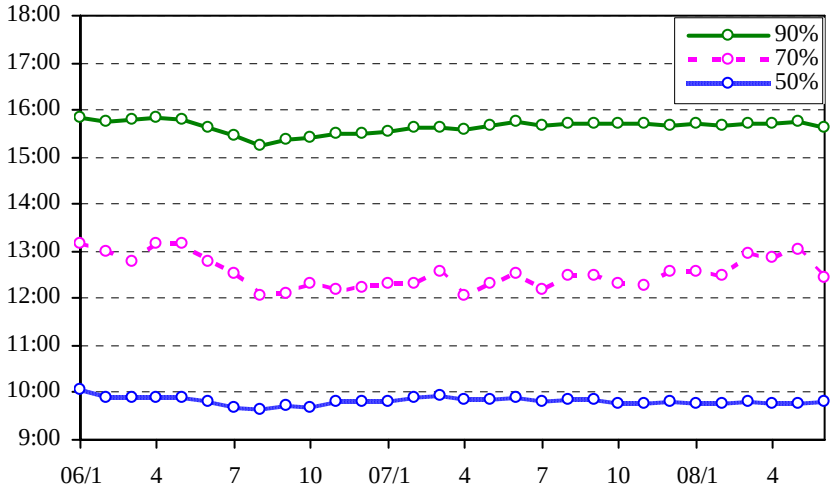
Chart 1-11:
Average Daily Value Settled and Liquidity Available for Settlement



Notes: 1. The daily average for each reserve maintenance period.
2. The daily average of intraday peak overdrafts.
Source: Bank of Japan

Chart 1-12 shows the timing of interbank transfers in the BOJ-NET Funds Transfer System. Despite the rising turnover ratio, participants continue to observe the market guidelines relating to the trading and settlement[5]of call money transactions, with more than 50 percent of cumulative value settled by 10:00 and more than 70 percent by 13:00. In other words, the concentration of payments continues to occur in the morning just after the start of operations.

Chart 1-12:
Timing of Interbank Transfers in the BOJ-NET Funds Transfer System[1]

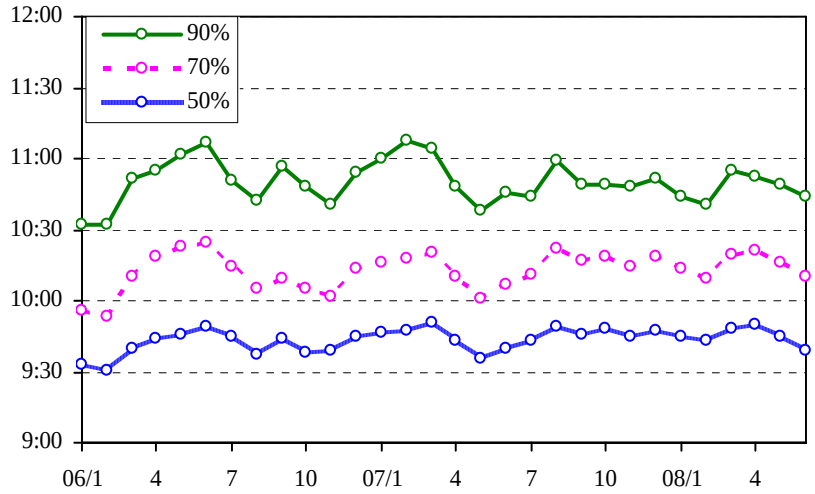


Note: 1. Shows the average times at which 90 percent, 70 percent, and 50 percent of the daily cumulative value of interbank transfers were settled in the BOJ-NET Funds Transfer System.
Source: Bank of Japan.

Turning to settlement of JGB transactions (DVP for JGBs), the overall timing of settlement was delayed in the summer of 2006, as participants' operations were unable to keep up with the sharp increase in JGB settlement volume (Chart 1-13). The participants subsequently reviewed their back-office processing capabilities. After that, in spite of further increases in JGB settlement volume, the overall timing of settlement of JGB transactions has been stable when daily swings are averaged out.

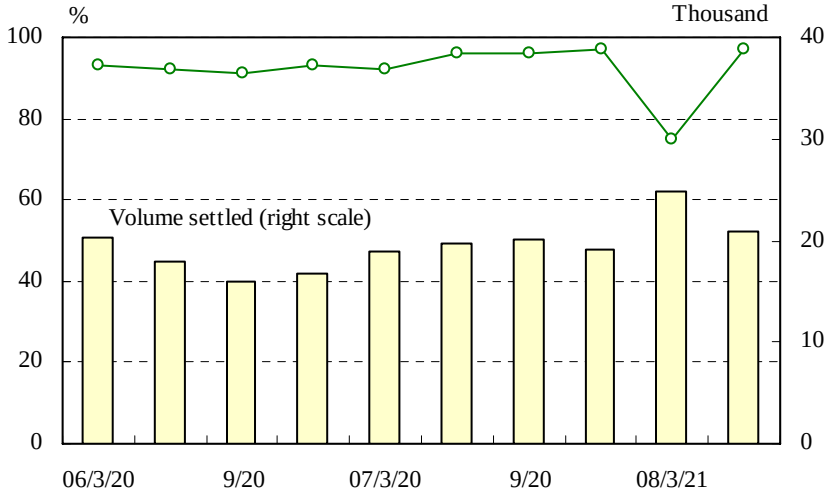
[5] The "repayment first rule" encourages borrowers to return call loans immediately after 9:00 and no later than 10:00. The "one-hour rule" encourages lenders of call loans to release the funds within one hour after a contract is made. These guidelines help relieve uncertainties about the timing of incoming payments.

Chart 1-13:
Timing of DVP for JGBs in the BOJ-NET JGB Services[1]



Note: 1. Shows the average times at which 90 percent, 70 percent, and 50 percent of the cumulative volume of JGB transactions were settled in the BOJ-NET JGB Services.
Source: Bank of Japan.

Chart 1-14:
Percentage of JGB Settlement Completed at 12:00 on Peak Volume Days



Source: Bank of Japan

Looking at the timing of JGB settlement on peak volume days,[6] significant delays were observed on March 21, 2008, which recorded a new peak in volume (Chart 1-14). Situations have been corrected as JGBCC and other participants improved their operations and

[6] Peak volume days are the 20th of March, June, September and December (or the next business day if it falls on a Saturday or Sunday). The issuance and redemption of JGBs are concentrated on those days and settlement volume and value tend to increase as a result of higher levels of trading.

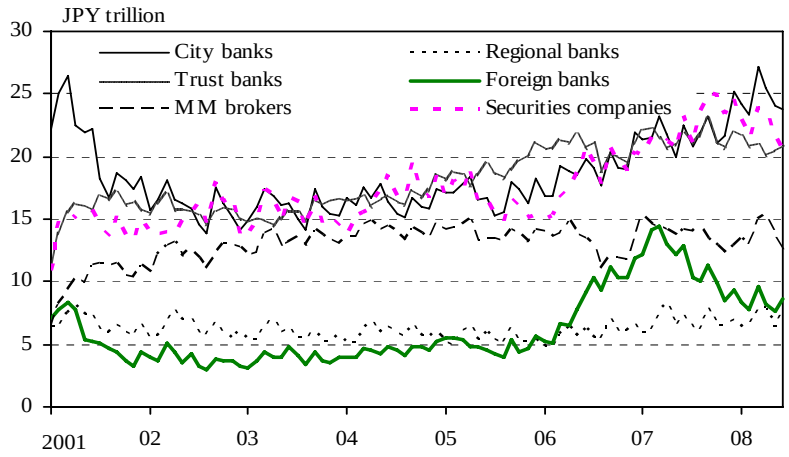
alleviated delays (see section B of this chapter for improvements in back-office procedures by JGBCC).

Overall, funds and JGB transfers over BOJ-NET have generally progressed smoothly in spite of the increases in volume and the higher turnover ratio. Such a stable pattern in the flow of payments and securities settlements can mitigate uncertainties in the intraday fluctuations of individual financial institutions' account balances at the Bank and can contribute to the stability of the short-term money market. The launch of Phase 1 of the next-generation RTGS project of the BOJ-NET Funds Transfer System in October 2008 is expected to further enhance safety and efficiency (see Part 2, Chapter I, section A, BOX 2-1 and BOX 2-2).

Chart 1-15 shows the daily average value of payments settled in the BOJ-NET Funds Transfer System with breakdown by the type of institution. The values continue to increase for city banks and securities companies. The value settled by foreign banks recorded a significant increase in 2006, but they peaked in early 2007 and have substantially decreased since then.

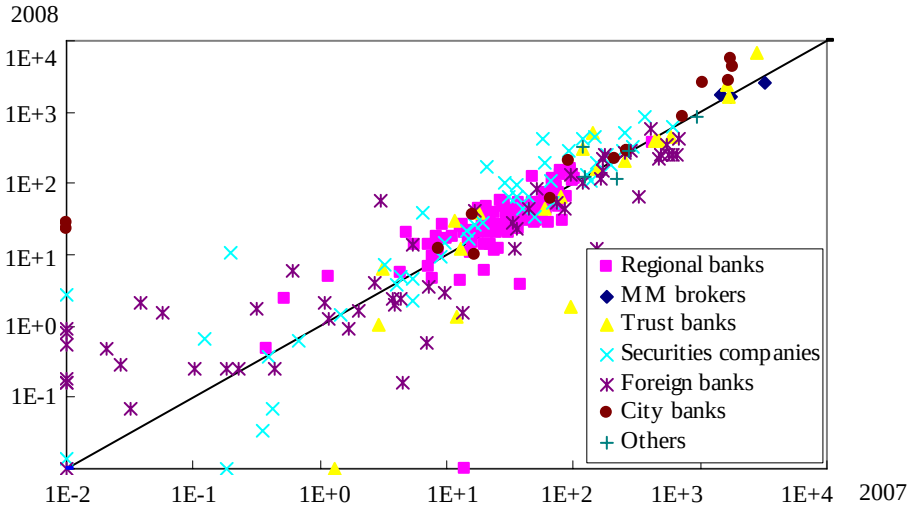
One of the factors behind the decline in settlement value by foreign banks was a technical one, reflecting the fact that a large foreign bank became a Japanese corporation in July 2007. However, declines in settlement value can also be observed for other foreign banks, particularly for larger users of the system (Chart 1-16). The declines seem to reflect efforts by those banks to reduce assets and restrict the need of market fund-raising in Japan in the wake of the subprime mortgage problem. During this period, the value settled by trust banks, money market brokers, and regional banks has remained generally flat, though there have been some swings.

Chart 1-15:
Value of Payments Settled in the BOJ-NET Funds Transfer System by the Type of Institution



Source: Bank of Japan.

Chart 1-16:
Value of Interbank Transfers Settled by Each Paritcipant[12]



Notes: 1. The vertical axis shows the average daily value (JPY billion) of interbank transfers for January 2008, and the horizontal axis shows that for January 2007. Institutions plotted above the 45-degree line had more payment activity in 2008, and those plotted under the 45-degree line had more payment activity in 2007.
2. 1E+0 = JPY billion, 1E+1 = JPY 10 billion.

Source: Bank of Japan.

B. Payment and Settlement Systems Operated by the Private Sector

1. Risk Management in DNS Systems

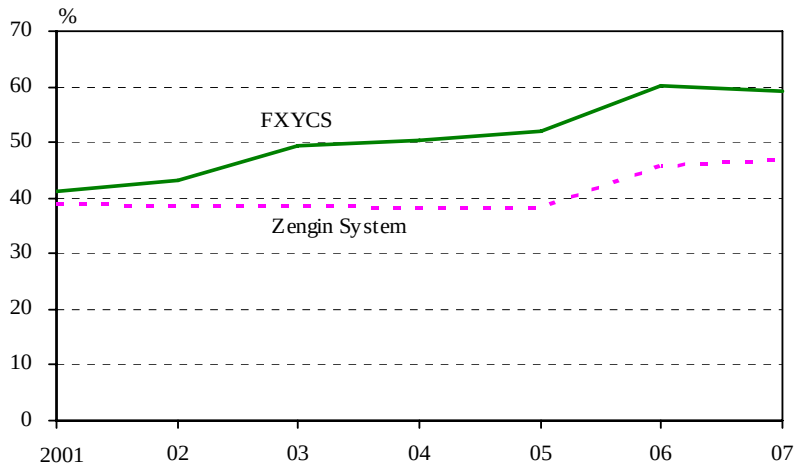
Until October, 14, 2008, FXYCS had two settlement modes, a DNS mode and an RTGS mode. In the DNS mode, payment instructions were cleared throughout the day for settlement through BOJ-NET. In the RTGS mode, payments were directed to BOJ-NET for settlement in full value. DNS was used for the majority of payments processed in FXYCS (approximately 70 percent in 2007), largely because DNS requires less amount of liquidity. With the launch of Phase 1 of the next-generation RTGS project, all FXYCS payments have moved to settlement on an RTGS basis (see Part 2, Chapter I, section A).

The Zengin System continues to operate entirely on a DNS basis. DNS systems have the possibility of unwinding payments submitted to the system in the event of a failure to settle by a participant, which can be a source of systemic risk. To manage such risk within the system, the Zengin System places a sender net debit cap on the maximum level of exposure that each participant can pose to the system. In sending payment instructions, each participant makes sure that its net short position stays within the cap. The system also has committed lines of credit from liquidity providers in order to ensure the timely completion of daily settlements in the event a participant fails to meet its settlement obligation.[7]

In the Zengin System, there has been an increase in the concentration of payments on a small number of participants, partly reflecting mergers between financial institutions (Chart 1-17). In a number of cases, those participants were temporarily unable to send payment instructions to the system because they have reached their sender net debit caps, causing delay in throughput.

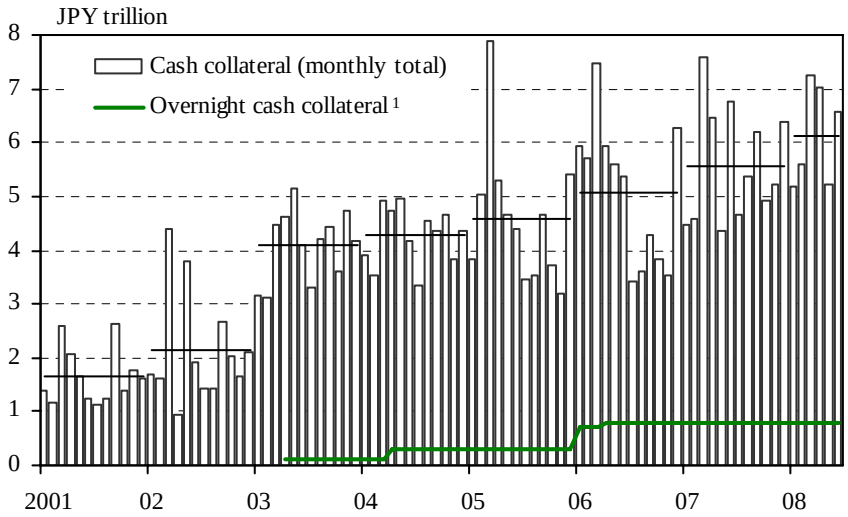
[7] For details on risk management measures in FXYCS and the Zengin System, see the section on Japan in Bank for International Settlements, "Payment and settlement systems in selected countries" (May 2003).

Chart 1-17:
Share of Top Three Participants in the Total Value Processed by FXYCS and the Zengin System



Source: TBA.

Chart 1-18:
Value of Cash Collateral Deposited with TBA



Note: 1. The value of cash collateral that was deposited the day before the last business day.
Source: TBA.

One solution for dealing with such situations would be to raise the sender net debit caps. However, such a raise would require an increase in the value of collateral deposited by participants and in the value of liquidity commitments, and would not be a suitable solution for participants on an ongoing basis. Taking a different approach, the system introduced steps that enable participants with the potential to reach the cap to temporarily raise their

sender net debit caps by depositing cash collateral with TBA.[8] This has become a common practice to avoid delays in sending payment instructions. Moreover, some participants deposit overnight cash collateral the day before the last business day of each month, the peak volume day, in order to send their payment instructions in advance. Those arrangements have reduced the frequency in which participants reach their net debit caps. The value of cash collateral deposited with TBA continued to increase in 2007 (Chart 1-18).

Cash collateral, by itself, is an appropriate risk management method, allowing completion of settlement within the day and alleviating delay in sending payment instructions without imposing excess burdens on liquidity provider banks. On the other hand, depending on the market environment, the cost incurred for raising additional funds could become large. With the launch of Phase 2 of the next-generation RTGS project scheduled for 2011, the value of payments settled on a DNS basis will be reduced, which is expected to reduce the size of settlement exposures within the Zengin System (see Part 2, Chapter I).

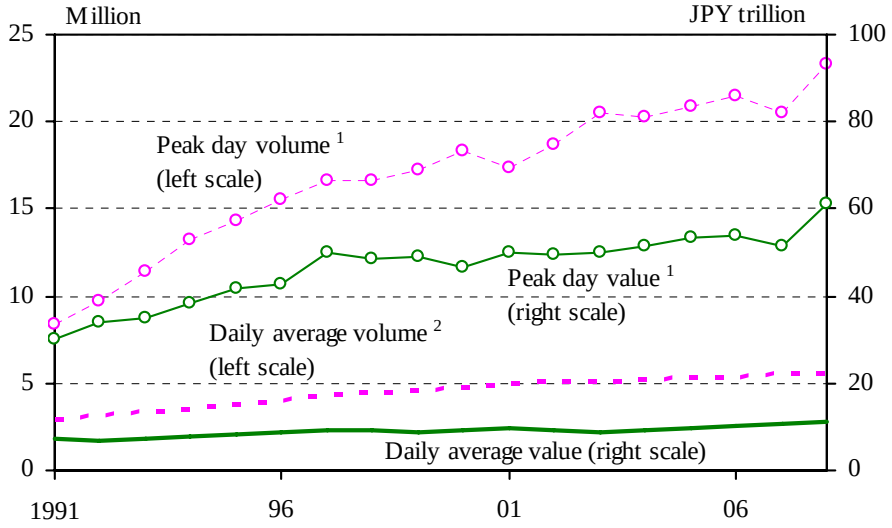
2. Operational Reliability

In the Zengin System, payments are increasingly concentrated on the last business day of each month, resulting in a wider gap between the volume processed on peak and regular days (Chart 1-19). Concentration of payments also occurs within the day, during the first two to three hours from the opening of the system, which places further pressure on the system's processing capacity. To mitigate the concentration of payments at peak times, starting from May 2006, the system has moved up the opening time by one hour from 8:30 to 7:30 on the last business day of each month. Furthermore, the system capacity was expanded during 2007 in order to meet the increase in payment volume.

As described in section A, the timing of JGB settlement (DVP for JGB) has been maintained at a stable level on the whole. However, after experiencing a substantial delay in JGB settlement on March 21, 2008, which was also the day when a new peak in DVP for JGB volume was recorded, many participants took various operational measures to cope with the peak volumes.

[8] When depositing cash collateral, unlike securities collateral, the liquidity providers' commitment value does not have to be raised, since cash collateral can be used immediately as liquidity in case of a failure by a participant to meet its settlement obligation.

Chart 1-19:
Peak and Average Daily Value and Volume of Payments Processed by the Zengin System



Notes: 1. Payment instructions are counted based on the date settled in the Zengin System.
2. Payment instructions are counted based on the date submitted to the Zengin System.
Source: TBA.

Most notable measures were the changes made by JGBCC to its settlement operations. JGBCC usually bundles each issue of JGBs received from the delivering participants into units of JPY 5 billion before it transfers those JGBs to the receiving participants. When the volume of DVP for JGBs spiked on March 21, 2008, JGBCC could not transfer JGBs to the receiving participants as smoothly as scheduled, resulting in substantial delay in JGB settlement. This is because a large number of JGBs in units less than JPY 5 billion flooded into JGBCC and it took time to bundle each issue of JGBs in unit of JPY 5 billion. To cope with this, JGBCC changed its operational procedures for peak hours of peak days, and started to prioritize the receipt of the JGBs that were already held by JGBCC but at less than the JPY 5 billion units, thereby accelerating the subsequent transfer of JGBs to the receiving participants.

3. Impact of the Bankruptcy of Lehman Brothers Japan[9]

On September 15, 2008, Lehman Brothers Holdings filed a petition for protection under Chapter 11 of the U.S. Bankruptcy Code, resulting in an administrative order by the Financial Services Agency in Japan to suspend a part of the operations of the company's local subsidiary, Lehman Brothers Japan (LBJ). On September 16, LBJ filed for the

[9] This section describes events as at September 30, 2008.

commencement of civil rehabilitation procedures, and on September 19, the Tokyo District Court issued a decision for rehabilitation procedures to commence.

The filing for bankruptcy by LBJ caused a chain of settlement fails and resulted in intraday delays that lasted for several business days in a number of securities settlement systems, but closing of LBJ's outstanding positions and rebuilding of positions by LBJ's counterparties were executed without significant delays in accordance with the rules of individual central counterparties and agreements between market participants. Overall, payment and settlement systems were able to avoid a situation where principal risk and counterparty risk materialize for a wide range of market participants, possibly leading to a chain of defaults. In effect, it has demonstrated the effectiveness of the various initiatives taken by relevant parties to reduce settlement risk, including introduction of risk management mechanisms by central counterparties, DVP for securities transactions, and PVP for foreign exchange transactions.

To explain the situation in more detail, the following paragraphs examine how JGBCC and market participants responded to the bankruptcy of LBJ in JGB markets.

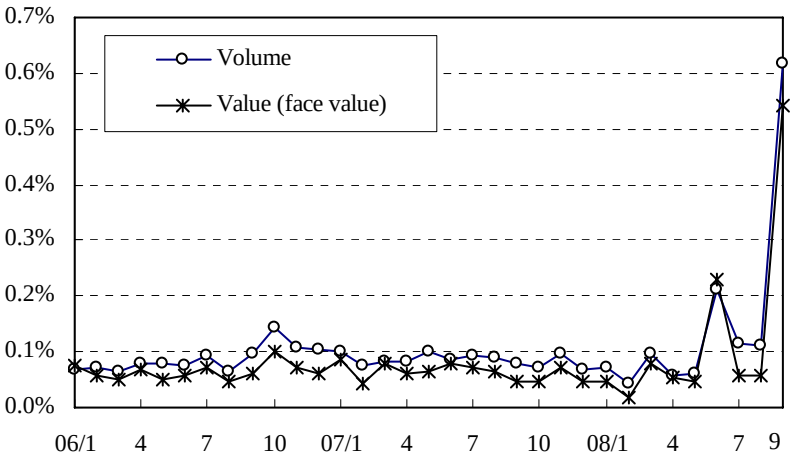
For JGB transactions cleared via JGBCC, immediately after the filing for bankruptcy by LBJ, JGBCC executed close-out netting of all rights and obligations it accepted from LBJ. As a result, all rights/obligations between LBJ and JGBCC involving (1) payments of funds by LBJ (transfers of JGBs by JGBCC to LBJ) and (2) transfers of JGBs by LBJ (payment of funds by JGBCC to LBJ) were replaced with a single money obligation, and settlements of categories (1) and (2) after bankruptcy were canceled. The non-execution of category (1) payments caused JGBCC's shortfalls in funds that were needed for receiving the JGBs (which were to be delivered to LBJ).[10] JGBCC covered the shortfalls with borrowings from

[10] Settlement of JGB transactions cleared by JGBCC is carried out in two steps: the first step requires that participants with net delivery positions delivers JGBs to JGBCC on a DVP basis (DVP1), and the second step requires that JGBCC delivers JGBs to participants with net receipt positions on a DVP basis (DVP2). For making payments for the receipt of JGBs from delivering participants, JGBCC obtains intraday liquidity from the Bank in the form of overdrafts by using the simultaneous processing of DVP and collateralization (SPDC) function of the BOJ-NET. After the bankruptcy of LBJ, there was no DVP2 settlement with LBJ (which means that LBJ did not purchase the JGBs and JGBCC did not receive funds to repay intraday overdrafts), so JGBCC raised funds from financial institutions under the its liquidity provision scheme (which had been put in place in advance) and made repayments of intraday overdrafts it incurred from the Bank in DVP1 settlement.

financial institutions by invoking the liquidity provision scheme. With those borrowings from financial institutions, JGBCC made all payments to the delivering participants and received JGBs as scheduled. This resulted in JGBCC temporarily holding JGBs and accumulating borrowings from financial institutions, but in accordance with the rules of JGBCC, JGBCC en-cashed the JGBs on the market and repaid borrowings.

As for the impact of non-execution of category (2) settlements, JGBCC failed to deliver JGBs (which were to be delivered from LBJ) to the receiving participants for several business days immediately after the filing for bankruptcy by LBJ. These fails spread to settlement within and outside JGBCC in the following sequence: (a) JGBCC → JGBCC participant A; (b) JGBCC participant A→ non-JGBCC participant B; (c) the non-JGBCC participant B → JGBCC participant C; (d) JGBCC participant C → JGBCC (Chart 1-20). These fails were, however, steadily resolved towards the end of September 2008, as JGBCC purchased necessary JGBs on the market and delivered them to the receiving participants.

Chart 1-20:
Settlement Fails



Source: Bank of Japan.

Turning to JGB transactions settled directly between market participants and LBJ (without going through JGBCC), repo transactions with LBJ were liquidated as stipulated in contracts by terminating transactions or executing close-out netting on grounds of default. Outright transactions with LBJ were in many cases simply canceled. For several business days immediately after the filing for bankruptcy by LBJ, volume and value of settlement fails increased sharply, because the default of LBJ led to a chain of settlement fails among market participants (Chart1-20). A chain of settlement fails is a situation where the LBJ's

inability to deliver JGBs to its counterparty causes this counterparty to fail on a sale of the same JGBs to the subsequent counterparty, causing this subsequent counterparty to fail on a similar sale to other market participants, and so on. This situation was also aggravated by the chain of settlement fails related to JGBCC as described above. Faced with these circumstances, market participants who were unable to receive JGBs as scheduled from LBJ rebuilt their positions by acquiring these JGBs on the market. Thanks to combined efforts of those market participants and JGBCC, settlement fails on the JGB market were almost resolved by the end of September 2008.

Looking at the settlement of other types of securities transactions, central counterparties took measures similar to JGBCC (e.g., the use of liquidity provision schemes, acquisition of securities on the market to alleviate settlement fails). As a result, despite the bankruptcy of LBJ, funds settlements were executed on schedule and long-term delays in securities settlements were avoided.

The bankruptcy of Lehman Brothers Holdings was an event of significant impact, leading to major upheavals in the global financial markets and a worldwide contraction in financial activities. However, in terms of the direct impact on payment and settlement systems in Japan, as described above, it can be said that the affected systems were able to avoid the widespread materialization of settlement risk. While more time will be needed before a detailed evaluation can be made, it will be particularly important that the relevant parties identify room for improvements that will further reduce settlement risk. For example, it will be necessary for central counterparties to review and study the steps that were taken to address the bankruptcy of LBJ, so as to identify further improvements that these institutions can make to their risk management mechanisms (e.g., liquidity provision scheme). From the perspective of preventing the accumulation of settlement fails as a result of the default on JGB settlements, there is also room to study the possibility of shortening the JGB settlement cycle as in the case of the U.S. (i.e., achievement of T+1 settlement).

BOX 1-2:
Developments in Operational Infrastructure Supporting OTC Derivatives

Recent years have seen substantial growth in the size of OTC derivatives markets, especially in the U.S. and Europe. With back office functions having difficulties keeping pace with the growth in trading activities, major dealers in those markets were faced with a high level of backlogs of confirmation, which raised a number of risk management issues.

In an effort to address those and other issues, groups such as the International Swaps and Derivatives Association (ISDA) and the Counterparty Risk Management Policy Group II (CRMPG II), which consists of experts from leading financial institutions, have called for industry-wide initiatives to improve operational processes for OTC derivatives. In addition, in September 2005, the Federal Reserve Bank of New York and other regulatory authorities met with major credit derivatives dealers and expressed their concerns about the risks created by the backlogs, which has prompted the industry to make further improvements. As a result of those efforts, significant progress has been made in reducing the level of confirmation backlogs.

Since the latter half of 2007, the focus of such initiatives has been shifted to issues such as credit event settlement and management of a close-out of a major counterparty (including calculating exposures and liquidation amounts). Reflecting growing attention on counterparty risk management, a number of institutions in the U.S. and Europe, namely Eurex, NYSE Euronext, Chicago Mercantile Exchange/Citadel, Intercontinental Exchange/Clearing Corporation, are planning to introduce central counterparty (CCP) services for credit default swaps. A CCP can mitigate systemic impact from the default of a participant and can induce standardization of transactions covered by the CCP. At the same time, because CCP concentrates risk, it is critical that a CCP is equipped with robust risk management.

In Japan too, there is growing awareness of the importance of ensuring the stability of the OTC derivatives infrastructure, partly reflecting the experiences following the bankruptcy of Lehman Brothers. While the OTC derivatives market in Japan is still much smaller in scale than those in the U.S. or Europe, the market itself has continued to expand. The Bank will support market participants in strengthening risk management of OTC derivatives transactions.

Part 2: Improvements in Payment and Settlement Systems

Chapter I: BOJ-NET Funds Transfer System

A. Next-Generation RTGS Project

1. Project Overview

In October 2008, the Bank of Japan went live with Phase 1 of the next-generation RTGS project of the BOJ-NET Funds Transfer System (BOJ-NET).

The next-generation RTGS project is designed to bring new levels of efficiency and safety to large-value payments in Japan and consists of the following two core components that were decided following a public consultation process:[12]

1. Introducing liquidity-saving features (LSF) to BOJ-NET;
2. Incorporating large-value payments that were previously processed by private-sector deferred net settlement (DNS) systems, namely Foreign Exchange Yen Clearing System (FXYCS) and the Zengin System, into BOJ-NET with LSF.

The project is implemented in two phases in order to minimize the costs and risks involved. Phase 1, which began on October 14, 2008, achieved the first component above and partly achieved the second by incorporating FXYCS payments into BOJ-NET. The remainder of the second component, i.e., incorporating large value Zengin payments, is scheduled to be achieved in the latter half of 2011 as Phase 2 of the project.

The introduction of LSF reduces the amount of funds and collateral that individual financial institutions need to prepare for settlement. It also enhances payment flows by effectively preventing "gridlock."[13] In effect, this enhances the overall efficiency in the system by achieving earlier settlement with less amount of liquidity. Earlier settlement also contributes

[12] See "Proposal for the Next-Generation RTGS Project of the BOJ-NET Funds Transfer System" (December 2005). For a detailed description of Phase 1, see "RTGS-XG Project Phase 1 Implementation Guide" (October 2007). Both can be obtained via the Bank website (http://www.boj.or.jp/en/).

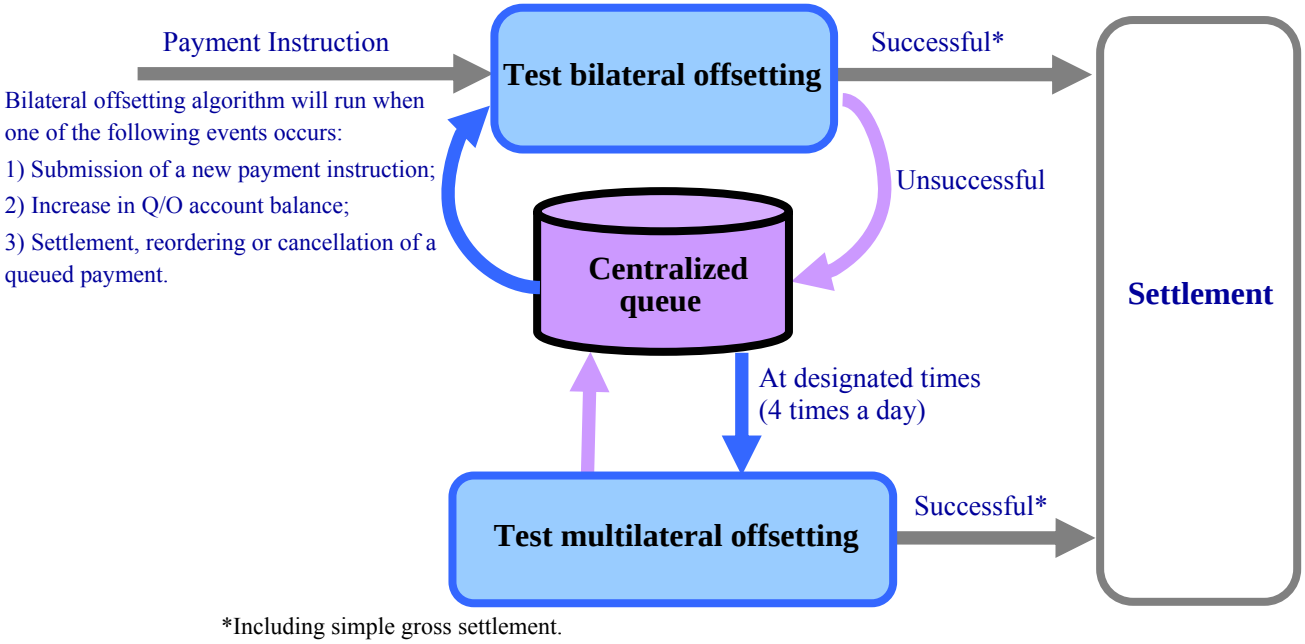
[13] "Gridlock" refers to a situation where payment instructions cannot be settled because multiple participants hold back their payments in order to economize on the use of their own liquidity by relying on the incoming funds from other participants.

to the reduction of intraday settlement exposure, which, combined with the shift of large-value payments from DNS to RTGS, enhances the safety of large-value payments.[14]

2. Introduction of Liquidity-Saving Features

Liquidity-saving is achieved by introducing centralized queuing and offsetting facilities (Chart 2-1). "Queuing facility" allows payment instructions to be held pending within the system. For example, previously in BOJ-NET, if a participant sends a payment instruction but did not have sufficient funds to complete the transaction, it was rejected by the system. In the new BOJ-NET, a payment instruction that does not satisfy the conditions for settlement will be placed in the central queue. "Offsetting facility" searches among the newly entered and queued payment instructions for a bilateral or multilateral set of instructions that can be settled when taking into account incoming payments as a source of liquidity, and settles those instructions simultaneously. In the new BOJ-NET, offsetting algorithms continuously identify and settle eligible instructions throughout the day, enabling payments to be settled earlier in the day using less amount of liquidity (Chart 2-2).

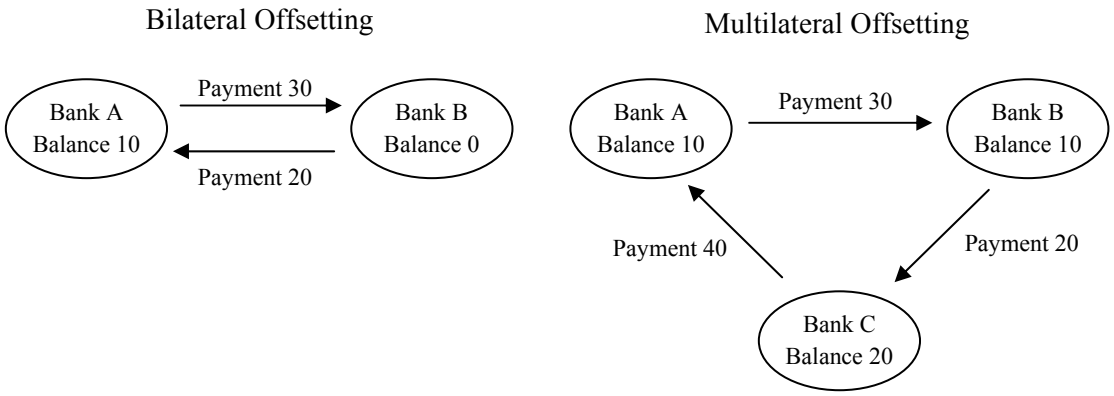
Chart 2-1:
Centralized queuing and offsetting



*Including simple gross settlement.

[14] See "Japan's Next-Generation RTGS" (October 2006). The document can be obtained via the Bank website (http://www.boj.or.jp/en/).

Chart 2-2:
RTGS Processing with LSF



* In the examples above, payment instructions cannot be settled individually but can be settled when taking into account incoming payments as a source of liquidity.

LSF is provided on a new type of current account provided specifically for utilizing queuing and offsetting facilities (Q/O accounts). At the start of Phase 1, 292 institutions representing approximately 80 percent of BOJ-NET online participants had opened Q/O accounts with the Bank (Chart 2-3).

Chart 2-3:
Number of Participants with Q/O accounts

Type of Institution	Online participants*	Of which: participants opening Q/O accounts
City banks	6	6
Trust banks	20	17
Regional banks	64	64
Regional banks II	45	44
Foreign banks	58	51
Shinkin banks	89	50
Securities companies	42	36
Money market brokers	3	3
Securities finance companies	3	3
Others	27	18
Total	357	292

*The number of online participants as of end-September 2008. Two regional banks II merged on October 14, 2008.

Before the go-live of Phase 1, the Study Group for Activation of Short-Term Money Market discussed market guidelines for money market transactions that would apply after the introduction of the new BOJ-NET. The new guidelines were published in March 2008 and implemented with the launch of the new system in October 2008. The guidelines state that market transactions[15] would in principle be settled on Q/O accounts. In addition, the guidelines contain other recommendations to market participants, such as to settle those transactions promptly and with high priority, and to prepare the necessary amount of liquidity on the Q/O account prior to submitting payment instructions.

3. Moving Payment Flows to BOJ-NET

"Core Principles for Systemically Important Payment Systems" published by the Committee on Payment and Settlement Systems (CPSS) in 2001 formulates basic principles to be adhered to in the design and operation of systemically important payment systems. The Core Principle IV states that "the system should provide prompt final settlement on the day of value, preferably during the day and at a minimum at the end of the day." FXYCS and the Zengin System had already achieved the minimum standard of final settlement at the end of the day, but had not achieved final settlement during the day, which is considered best-practice. With the completion of the next-generation RTGS project, including Phase 2, intraday finality will be achieved for large-value payments in those two systems by direct RTGS processing in BOJ-NET (Chart 2-4, Chart 2-5).

a. FXYCS Payments

Phase 1 brought RTGS processing with LSF to approximately JPY 16 trillion of FXYCS payments that had previously been processed in its DNS mode (daily average for 2007). The procedures for the DNS mode were abolished with the start of Phase 1. As a result, real-time intraday finality has been achieved for all transactions processed by FXYCS, including payments to and from CLS which continue to be settled on an RTGS without LSF.

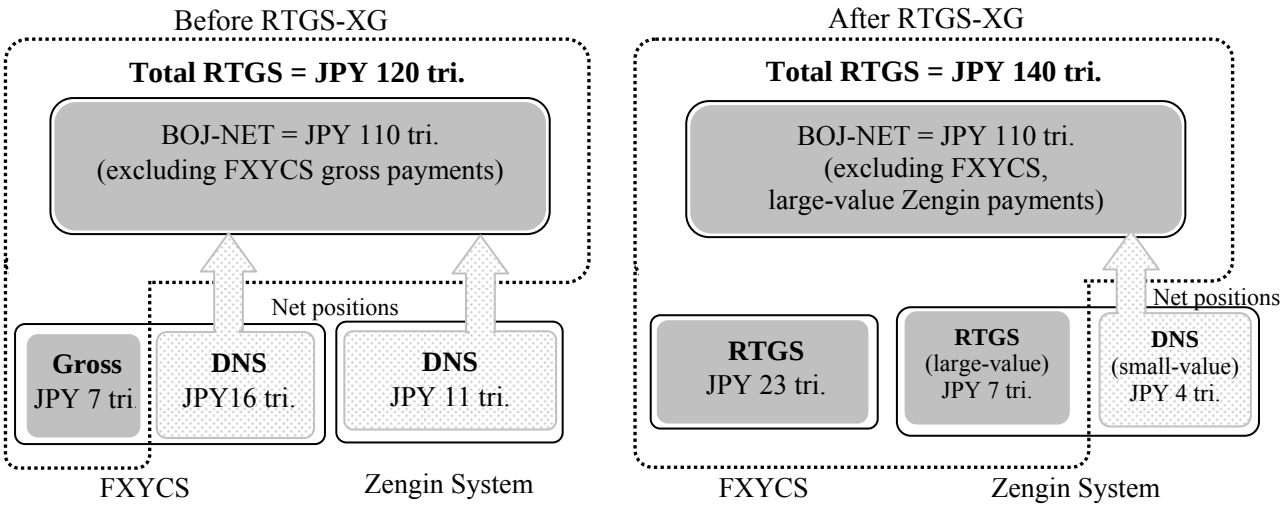
[15] Includes call money transactions (uncollateralized, collateralized, and intraday), NCD transactions, the cash legs of dematerialized CP and corporate and other bond transactions (non-DVP), margin call payments for repo transactions, the cash legs of pair-off netting transactions, and premiums arising from OTC securities option transactions.

As the operator of FXYCS, TBA has made changes to its rules to accommodate with the new procedures. For example, to facilitate interbank payments and the subsequent crediting of customer accounts, a new rule has been introduced which requires participants to send instructions by 14:00 when using Q/O accounts. For the same reason, based on the market guideline under the previous procedures, a new market guideline was agreed and launched among participants. The new guideline encourages participants to send and settle by 11:00, 65 percent of the daily volume and 55 percent of the daily value of payments eligible for settlement on Q/O accounts.

b. Large-Value Zengin Payments

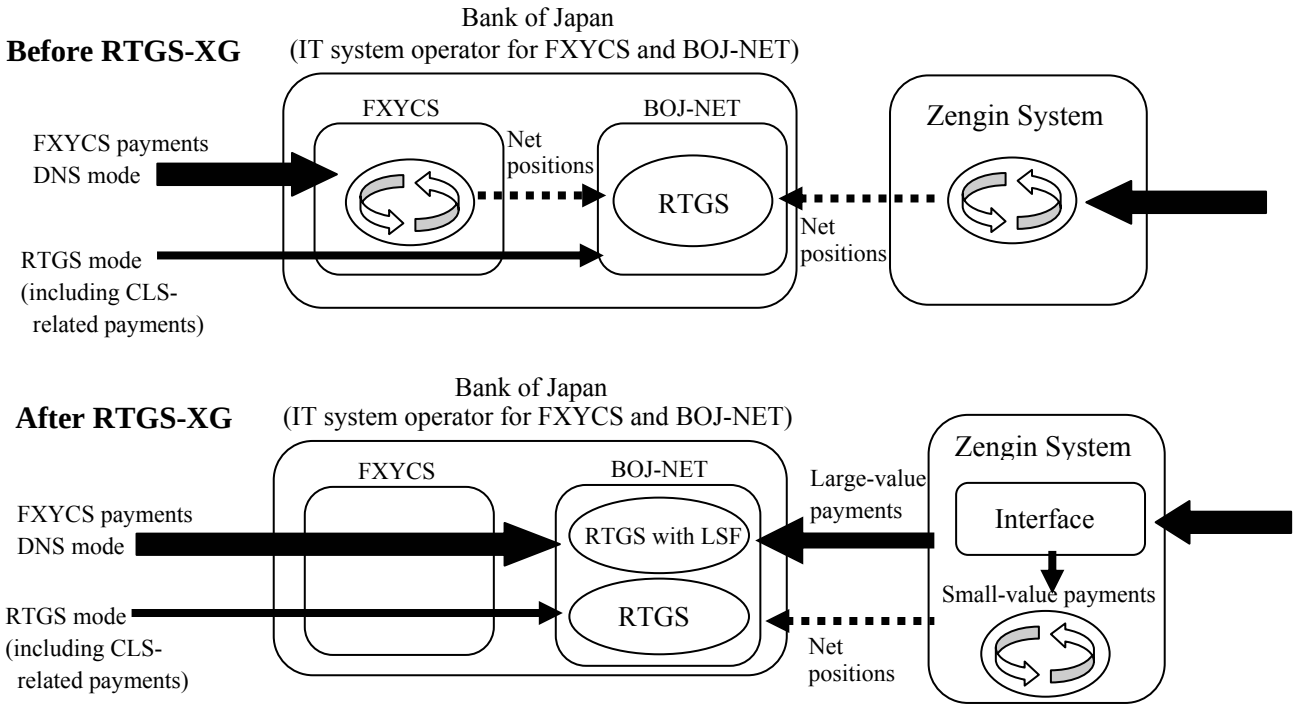
The migration of large-value Zengin payments to RTGS is scheduled for the latter half of 2011 in coordination with the next upgrade of the Zengin System. More specifically, a newly constructed interface within the Zengin System will connect the system to the BOJ-NET, and large-value Zengin payments (defined as payments above JPY 100 million) will be routed to the BOJ-NET through the interface. Smaller-value payments will continue to be processed on a DNS basis in the Zengin System. The transactions that will be settled on an RTGS basis are estimated to represent less than 1 percent of the total volume of payments processed in the Zengin System, but approximately 65 percent in terms of the total value (JPY 7 trillion).

Chart 2-4:
Planned Migration of Payment Flows



*Daily average value processed in 2007.

Chart 2-5:
A Stylized Picture of Payment Routing to BOJ-NET



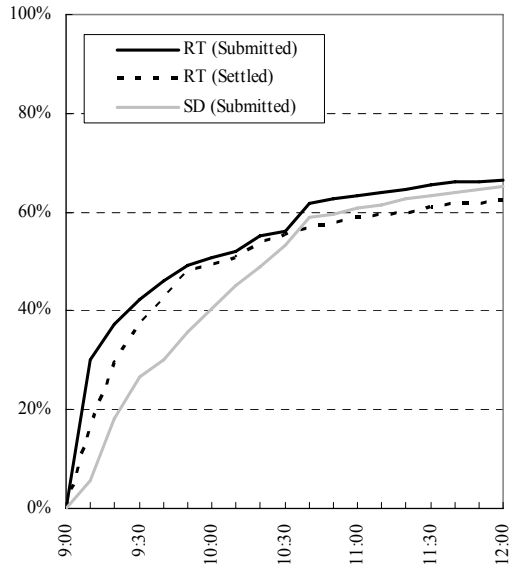
BOX 2-1:
Possible Intraday Payment Pattern under the New BOJ-NET

Beginning in June 2008, the Bank held three running tests (RT) in advance of the "go-live" of the next-generation RTGS project, with participation of virtually all institutions that were planning to open Q/O accounts. The tests made use of actual transaction data from selected business days and aimed to familiarize participants with the procedures for sending payment instructions and managing intraday payment flows under the new environment.

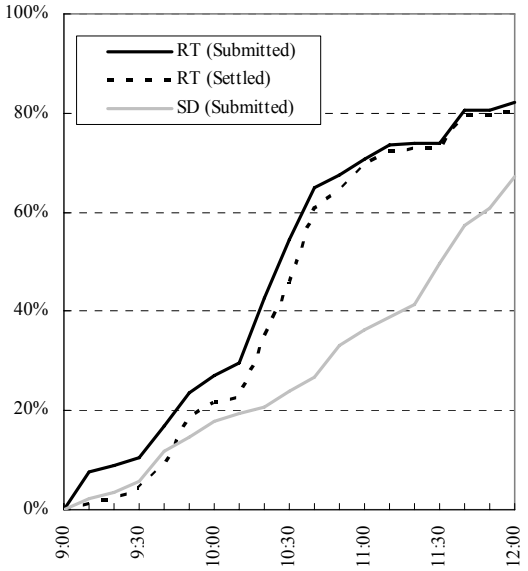
Chart B2-1-1 shows the timing of payments submitted and settled during the day in the first running test conducted on June 15, providing a picture of the possible intraday payment pattern after the go-live of the next-generation RTGS project. On the test day, participants sent approximately 50 percent of the day's market transactions by 10:00 and 70 percent of the day's FXYCS transactions by 11:00, which was earlier compared with the actual payment pattern observed on May 12 under the previous BOJ-NET. The results also indicated that, with LSF functioning effectively, smooth flow of payments was achieved with no large time lag between submission and settlement.

Chart B2-1-1:
Timing of Payment Submission and Settlement (Cumulative Value)

Market transactions



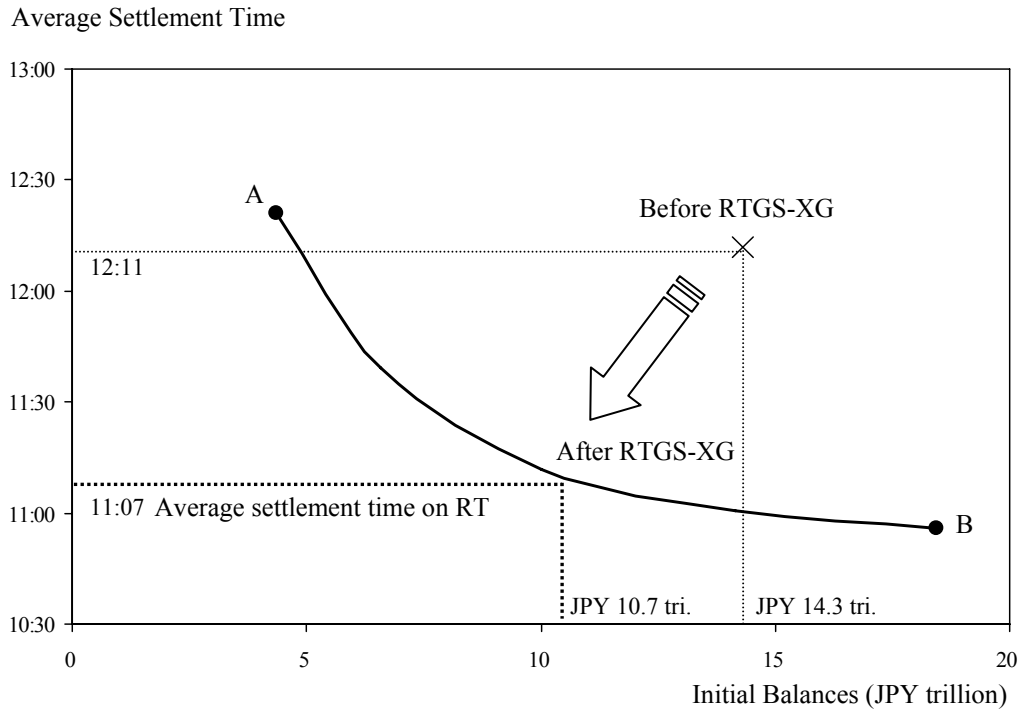
FXYCS transactions



* The chart shows the cumulative value of payments sent and settled as a percentage of the day's total value.
* The RT used actual transaction data for May 12, 2008 (Sample Day, SD) which was an average day in terms of transaction value and volume. The data set included market transactions (6,200 payments, JPY 35 trillion) and FXYCS transactions (33,600 payments, JPY 23 trillion) that are planned to be settled on Q/O accounts in the new BOJ-NET. A total of 281 financial institutions participated in the RT.
* Participants were free to set the order and timing for submitting payment instructions in consideration of the new market guidelines. To understand the amount of liquidity needed in the new BOJ-NET, the amount of liquidity that each participant can transfer to its Q/O account at the start of the day (between 9:00 and 9:20) was limited to less than half of the actual initial balance that each participant had on May 12, 2008.

Chart B2-1-2 illustrates the relationship between average settlement times and the amount of liquidity required in the previous and new BOJ-NET. The average settlement time under the previous BOJ-NET based on the actual data for May 12 was 12:11, while the time based on the test results was 11:07. This reflects the shift of FXYCS payments from DNS to RTGS and earlier submission of payment instructions. The level of initial liquidity required (theoretical value) to achieve the average settlement time was JPY 14.3 trillion under the previous BOJ-NET and JPY 10.7 trillion under the new BOJ-NET with LSF. Those results indicate that the next-generation RTGS project can facilitate smooth payment flows while reducing the amount of liquidity required for settlement.

Chart B2-1-2:
Average Settlement Time and Initial Balances



* Curve AB shows the relationship between the level of initial balances and the average settlement time, which was calculated based on the payment instruction submission pattern observed in the first RT. Initial balance for each participant is equal to the amount of its multilateral net debit position for the day at point A and equal to the amount of its "peak debit position" for the day at point B. Peak debit position refers to the largest amount of difference between cumulative outgoing payments and cumulative incoming payments that the participant reaches during the day. By having initial balances equal to the amount of peak debit position, a participant will be able to settle all payments without having any instruction queued.
* The point "Before RTGS-XG" shows the actual average settlement time and initial balances on May 12, 2008, where market transactions are settled on an RTGS basis without LSF and FXYCS transactions are settled on a DNS basis with final settlement at 14:30.
* Average settlement time is value-weighted, meaning that the settlement time for each instruction is multiplied by the value of the transaction, the sum of which is then divided by the aggregate transaction value. For example, if there were two payment instructions, one totaling JPY 10 billion that settled at 9:00 and another totaling JPY 50 billion that settled at 10:00, the average settlement time would be 9:50.

BOX 2-2:
Reducing the Liquidity Impact of a Participant-Level Disruption in BOJ-NET

As was noted in Part 1, recycling of liquidity among participants allows the BOJ-NET to settle payments worth JPY 120 trillion, or four times of the total amount of available liquidity. In such an environment, an inability of one participant to make payments, owing to an operational failure or some other reasons, could have a significant impact on other participants that were planning to use the incoming funds from the disrupted participant to fund their own payments. To quantify such risk in the BOJ-NET, we used a simulation approach as described below. The results showed that the introduction of LSF in BOJ-NET can significantly reduce the risk that the effect of a failure of one participant to meet its payment obligation will spread throughout the entire system.

The simulation used actual transaction data for September 2007 by extracting specific types of market transactions and FXYCS transactions that would be settled on Q/O accounts in the new BOJ-NET. In the simulation's stress scenario, it was assumed that a large participant is unable to make payments for the entire day, with contagion effects measured for both BOJ-NET with and without LSF. The impact was measured by: (1) the value and volume of unsettled payments between non-disrupted participants; and (2) the degree of settlement delay for payments between non-disrupted participants. The level of liquidity to be prepared by each participant $L(\alpha)$ was defined as below.

$$L(\alpha) = UB - \alpha(UB - LB)\ , 0.0 \le \alpha \le 1.0$$

UB is the peak debit position during the day; LB is the net debit position for all payments to be settled on that day; and α is a set of variables for liquidity levels. When α = 0.0, L (α) = UB; when α = 1.0, L (α) = LB. α is set in five patterns in increments of 0.25.

Chart B2-2-1 shows the outcome of the simulations in terms of the total value and volume of payments that were left unsettled at the end of the day as a result of inability to settle by one participant in BOJ-NET without LSF. It indicates that the failure to settle outgoing payments by the disrupted participant (equivalent to approximately 10 percent of the total value and 20 percent of the total volume) can result in a large number of payments between non-disrupted participants to remain unsettled (darkly shaded area). For example, when the liquidity level is α = 0.5, the value of unsettled payments between non-disrupted participants is as large as the value of unsettled outgoing payments by the disrupted participant. The contagion effect becomes larger as the level of liquidity in the system is

reduced. With liquidity level reduced to α = 1, roughly half of the total value of payments between non-disrupted participants remain unsettled.

Chart B2-2-1: Unsettled Payments in BOJ-NET without LSF

Value (JPY trillion) Volume

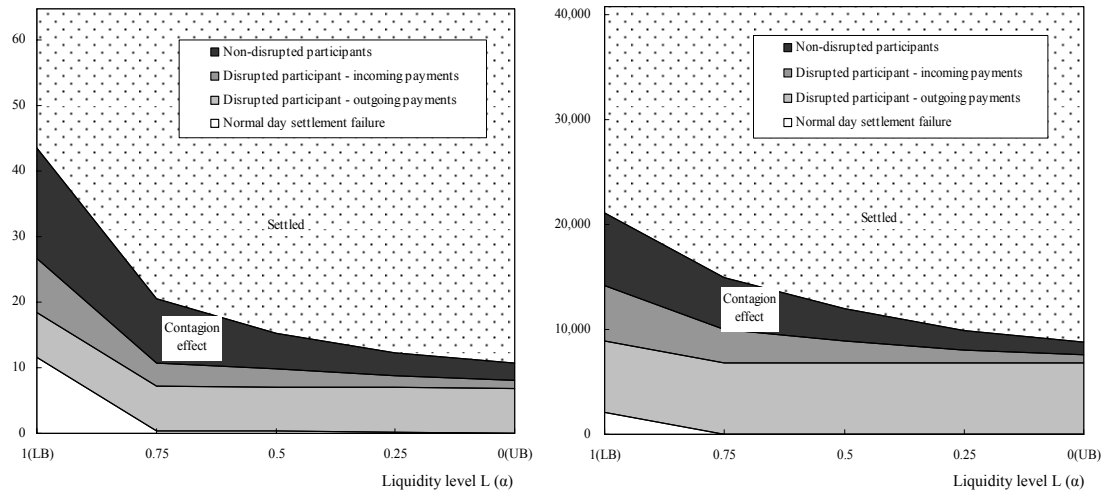
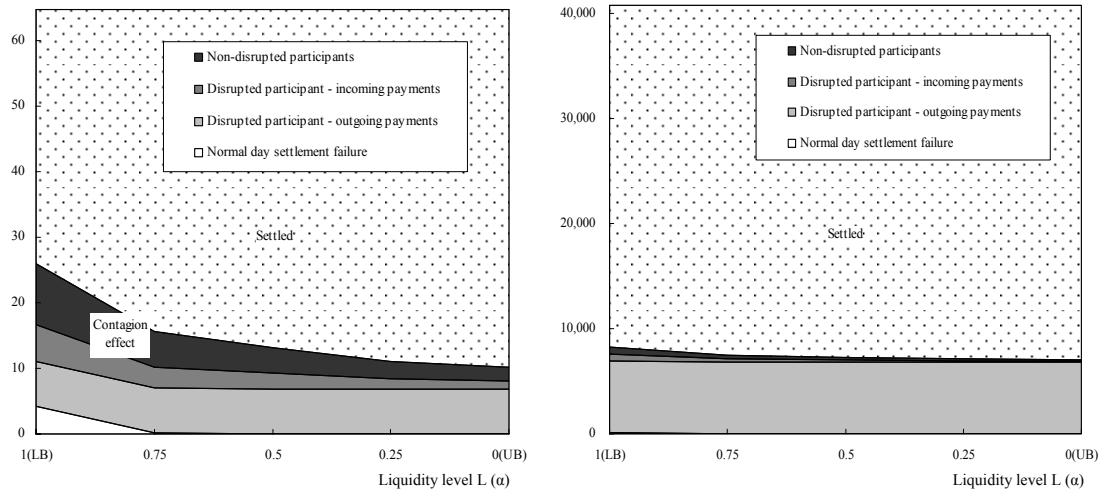


Chart B2-2-2: Unsettled Payments in BOJ-NET with LSF

Value (JPY trillion) Volume



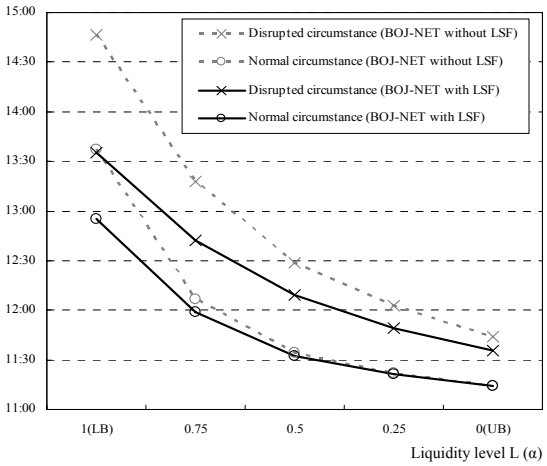
* The charts show the average of the results of simulations that were carried out to test the operational failure of each of the three largest participants in terms of transaction value. It was assumed that there were no changes in the behavior of non-disrupted participants. In other words, non-disrupted participants continued to send payment instructions for payments to the disrupted participant.
* In all scenarios, it was assumed that all FXYCS payments, including those that were actually settled on a net basis at 14:30, were settled on a gross basis. The timing of submitting payment instructions was assumed to be the same for all scenarios (i.e., changes in the timing as a result of the introduction of LSF were not taken into account).

Chart B2-2-2 shows the results of the simulations for BOJ-NET with LSF. Compared to

BOJ-NET without LSF, there is a significant reduction in the value of unsettled payments, particularly where liquidity levels are low (i.e., when participants are subject to liquidity constraints even in normal circumstances). In terms of volume, the majority of the payments that could not be settled without LSF can be settled LSF. This indicates that the introduction of LSF can substantially mitigate the operational impact on non-disrupted participants in the event of a failure to settle by a large participant.

Chart B2-2-3 compares the average settlement times of payments between non-disrupted participants to analyze the degree of settlement delay under the simulated scenarios. Under normal circumstances, there are no significant differences in settlement times between BOJ-NET with and without LSF, except where the liquidity level is set at the net debit position for each participant ($\alpha = 1$). However, where a large participant is not able to settle, earlier settlement was achieved in BOJ-NET with LSF for all liquidity levels. The degree of settlement delay in BOJ-NET with LSF is on average about half of that of BOJ-NET without LSF.

Chart B2-2-3:
Average Settlement Time for Payments between Non-Disrupted Participants



* Simulation assumptions and scenarios are the same as Chart B2-2-1 and Chart B2-2-2.
* Average settlement times for unsettled transactions are set at the end of the operating hour.

The analysis above verifies that the introduction of LSF in BOJ-NET can mitigate a systemic impact in a stress environment in which a participant is not able to settle its payments. At the same time, the results show that the impact cannot be fully eliminated even with LSF. It is important that individual financial institutions continue to take other steps to reduce such impact, including developing and enhancing alternative procedures for continuing settlement in the event of operational or other incidents.

B. Upgrades to Network Infrastructure

The Bank has been working to upgrade the network infrastructure of BOJ-NET with a view to adapting to advances and standardization in networking technology.[16]

1. New BOJ-NET Terminals

PC-based BOJ-NET terminals have been available for use since November 2006. The new access method replaces the previous dedicated terminals with general-purpose personal computers, achieving enhanced functionalities, shorter implementation period, and a reduction in initial costs. In addition, the new method uses a removable device (USB token) to identify and verify the user. This approach enables financial institutions to conduct operations using other terminals within their own offices or terminals in other offices with appropriate telecommunications equipment by inserting the token into those terminals. In this way, PC-based terminals also contribute to enhancing business continuity capabilities to address system failures or natural disasters. By April 2008, all BOJ-NET online participants (approximately 420 institutions) had completed their transition to the PC-based terminals.

2. TCP/IP-Based Computer-to-Computer Connection

In 2005, the Bank introduced a new computer-to-computer connection method.[17] The new method uses a standard communication protocol, TCP/IP,[18] instead of the traditional *Zenginkyo* protocol.[19]

There has been a steady increase in the number of users converting to the new computer connection method. By the time of the go-live of the Phase 1 of the next-generation RTGS project, all participants using computer-to-computer connections (52 institutions) had switched to the new method.

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[16] See "Framework for Improving the Network Infrastructure of the BOJ-NET" (February 2003). The statement is available on the Bank website (http://www.boj.or.jp/en/).

[17] Computer-to-computer connection is an unattended access method that connects the Bank's computer center and participants' computer centers for direct data transmission.

[18] Transmission Control Protocol/Internet Protocol (TCP/IP) is the current international standard for communication protocol used widely on the Internet.

[19] Protocol developed by the Japanese Bankers Association.

The adoption of standardized technology for network infrastructure is expected to broaden the options for both hardware and software used for BOJ-NET, improve compatibility between the BOJ-NET and user systems, and reduce connectivity costs.

3. Establishment of "Task Force for New BOJ-NET Planning"

In October 2008, the Bank established the "Task Force for New BOJ-NET Planning" to investigate options for system architecture of a future BOJ-NET in light of assessment results of the current system. The Task Force will consider and set basic principles for issues such as the functions and configuration that the system should have, approaches to system development, as well as its size and how it can be achieved.

Chapter II: Securities Settlement Systems

A. Reform of Securities Settlement Systems

Japan's securities settlement systems have undergone major reforms in recent years to achieve the goals of: (1) establishment of a uniform legal framework; (2) implementation of straight-through-processing (STP: automated processing of the entire lifecycle of securities transactions from trade confirmation to settlement); and (3) achievement of a delivery-versus-payment (DVP).

The Bank has participated in discussions and studies of the reforms led by other related institutions (e.g. the Japan Securities Dealers Association (JSDA), the Legislative Council of the Ministry of Justice), and continued its efforts to improve safety and efficiency of the JGB settlement system that it operates, tackling both the operational side and the system itself.

The Bank has also supported private-sector securities settlement systems for achievement of the reforms as a provider of payment services. For dematerialized CP, corporate and other bonds, and investment trusts, the Bank has helped set up links between the BOJ-NET Funds Transfer System and private-sector securities settlement systems for the achievement of DVP and the implementation of STP. The Bank is now working on the setting up of the similar links for stocks and bonds with warrants (hereinafter collectively referred to as "stocks").

B. JGB Book-Entry System

The Bank operates the JGB Book-Entry System, the securities settlement system for dematerialized JGBs (book-entry JGBs).[20]

There are three forms of participation in the JGB Book-Entry System: "direct participants" (account management institutions holding accounts directly at the Bank): "indirect

[20] The Bank also operates the JGB Registration System as a JGB settlement system. But, when the tax exemption scheme applicable for registered JGBs was abolished in January 2001, most of JGB holdings were shifted from registered JGBs to book-entry JGBs which are still entitled to tax exemption. Therefore, the weight of registered JGBs is extremely small at this time (registered JGBs account for approximately 0.03 percent of outstanding bearer JGBs at the end of 2007).

participants" (account management institutions with accounts at a direct participant); and "foreign indirect participants" (indirect participants opening customer accounts in foreign countries).[21] The number of direct participants is in decline mainly due to mergers among financial institutions. Some indirect participants terminated their participation as a result of mergers, but agricultural cooperatives, credit unions, and smaller securities companies have entered as new participants with an aim of providing JGB sales and custody services for individual investors, which resulted in a slight increase in the overall number during FY2007. The number of foreign indirect participants also continues to grow (Chart 2-6).[22]

The Bank has conducted and published in November 2007 a self-assessment of the JGB settlement system's compliance with the "Recommendations for Securities Settlement Systems" issued by CPSS/IOSCO. The assessment covers the institutional arrangements for confirmation, clearing and settlement of book-entry JGBs in over-the-counter market, and evaluates its compliance with the minimum international standards for securities settlement systems. The results indicate that the JGB settlement system "observed" 17 out of the 18 recommendations, and "broadly observed" one on trade confirmation.

Chart 2-6:
Number of participants in JGB Book-Entry System (as of end-March)

	2002	2003	2004	2005	2006	2007
Direct participants	361	349	338	330	329	324
Indirect participants	1,123	1,081	1,064	1,059	1,054	1,061
Foreign indirect participants	54	67	93	112	126	131

Source: Bank of Japan.

[21] A new category of participation "foreign indirect participant" was introduced with the amendments to the tax code in fiscal year 2001 which allow the exemption of withholding tax levied on interest income of book-entry JGBs that are held by nonresident investors/foreign companies and deposited through business or liaison offices of financial institutions in foreign countries provided that certain conditions are met (Article 5-2 of the Special Taxation Measures Law).

[22] In July 2005, the Bank clarified and simplified the documentation for approval of foreign indirect participants in the JGB Book-Entry System, bringing greater efficiency to approval procedures. For details, see the Bank website (http://www.boj.or.jp/en/).

C. Initiatives in Securities Settlement Systems Operated by the Private Sector

1. Full Dematerialization of Securities

Japan has been moving steadily forward with the full dematerialization of securities as called for in the "Act on Transfer of Bonds, etc." and its subsequently amended version "Act on Transfer of Bonds, Shares, etc. (Transfer Act)." Full dematerialization was achieved for JGBs and CP in 2003; corporate and other bonds in January 2006; investment trusts other than exchange traded funds (ETF) in January 2007; and ETF in January 2008.[23] Japan Securities Depository Center (JASDEC) and other market participants are now in the process of achieving the dematerialization for stocks as well. The target date is in January 2009.

a. ETF

Based on the "Act on Transfer of Bonds, etc.," JASDEC was designated as the book-entry transfer institution for ETF, and started the ETF book-entry transfer system in January 2008. Since then, all types of ETF listed on financial instruments exchanges in Japan have been settled under this system.

b. Stocks

Since 1991, JASDEC has operated a custody and book-entry transfer system for stocks based on the "Act on Custody and Transfer of Share Certificates, etc." Under the system, participants' stock certificates are deposited with JASDEC and transferred by book entries on transfer accounts books held with JASDEC ("immobilization" of stocks).[24]

JASDEC, market participants, and relevant institutions have also spent several years preparing for the full dematerialization of stocks. Consequently, JASDEC as the book-entry

[23] The Bank serves as the book-entry transfer institution and operates the settlement system for JGBs; JASDEC does the same for dematerialized CP, corporate and other bonds, and investment trusts. Both are governed by the "Act on Transfer of Bonds etc."

[24] The system is similar to the book-entry system for corporate and other bonds based on the "Act on Transfer of Bonds etc." in that it employs a multi-tired book entry system; but it is different from the system for corporate and other bonds in that it handles physical certificates. In other words, the system achieves "immobilization" rather than "dematerialization" of securities.

transfer institution is planning to start a book-entry transfer system for stocks based on the Transfer Act in January 2009 (the achievement of full "dematerialization"). As of October 2008, system participants and JASDEC are testing their systems and making the final preparations for the changeover to the new system.

With implementation of the Transfer Act, stocks of all listed companies will be dematerialized and physical certificates will become invalid. At that time, stock certificates deposited with JASDEC under the existing system will be automatically moved to the new book-entry transfer system for stocks. However, shareholders of the certificates not deposited with JASDEC may encounter impediments to the exercise of their rights.[25] To alleviate this, JASDEC and JSDA have been conducting wide-ranging, large-scale public relations activities, including organizing explanatory meetings, advertising in the mass media, and distributing pamphlets to listed company shareholders, so as to encourage early deposit of physical certificates with JASDEC, particularly for those stored by individual investors. The Bank and other related institutions have been providing support for these public relations activities.

2. Achievement of DVP

Alongside the full dematerialization of securities, the achievement of DVP will be important in reducing securities settlement risk, particularly principal risk.

DVP mechanism was first introduced for JGB settlement in 1994, and has gradually expanded to cover other types of securities (Chart 2-7).[26]

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[25] Stock certificates not deposited with JASDEC are moved to the new book-entry transfer system for stocks by using accounts that are opened automatically by the issuer company in the name of the shareholder listed on the shareholder registry ("special accounts"). However, to sell stocks recorded on special accounts, a shareholder has to open a separate trading account with a securities company, and transfer its holdings from the special account beforehand. If the holder of securities is not the titleholder recorded on the shareholder registry, then the cooperation of the titleholder is required for transfer of securities from the special account.

[26] There are several models for DVP settlement. The CPSS report "Delivery versus Payment in Securities Settlement Systems" (September 1992) puts these models into the following three categories based on whether securities and funds settlement takes place on a gross (trade-by-trade) or net basis: (1) "gross-gross" (transfer instructions for both securities and funds are settled on a trade-by-trade basis, with transfer of securities occurring at the same time as transfer of funds); (2)

Chart 2-7:
DVP schemes

	Securities	Type of DVP model	Central securities depository	Cash settlement institutions
1994	JGBs	Gross-Gross	Bank of Japan	Bank of Japan
1998	Corporate and other bonds (registered securities) *abolished in 2007	Gross-Net *simultaneous processing at 15:00	Each registrar banks	Bank of Japan
2001	Stocks (exchange trades)	Net-Net	JASDEC	Bank of Japan Commercial banks
2003	CP	Gross-Gross	JASDEC	Bank of Japan
2004	Stocks (off-exchange trades)	Gross-Net	JASDEC	Bank of Japan
2006	Corporate and other bonds (book-entry securities)	Gross-Gross	JASDEC	Bank of Japan
2007	Investment trusts	Gross-Gross	JASDEC	Bank of Japan
2009 (planned)	Stocks (primary market transactions)	Gross-Gross	JASDEC	Bank of Japan

In expanding the use of DVP for various types of securities, the Bank was involved in the studies of DVP schemes and links between securities settlement system and the BOJ-NET Funds Transfer System, and made necessary system developments and operational changes.

For stocks, DVP is already used for settlement of the secondary market transactions. The Bank is working with JASDEC and other market participants to achieve DVP for the settlement of primary market stock transactions, along with the current move to "dematerialization."

In terms of DVP model for primary market stock transactions, JASDEC is planning to use gross-gross type DVP (RTGS), in which transfer instructions for both securities and funds

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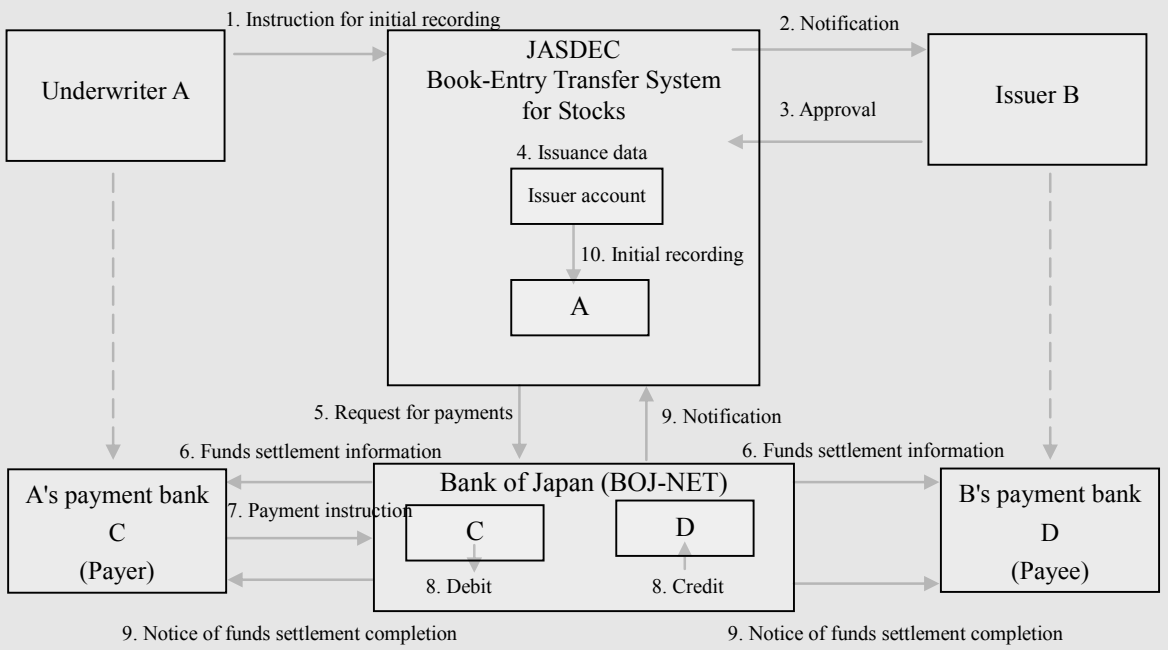
"gross-net" (transfer instructions for securities are settled on a trade-by-trade basis, with corresponding transfer of funds occurring at the end of the processing cycle on a net basis); and (3) "net-net" (transfer instructions for both securities and funds are settled on a net basis, with transfer of both securities and funds occurring at the end of the processing cycle). Japanese securities settlement systems use one of these models depending upon the trading practices and trading activities for the specific securities.

are settled immediately on a trade-by-trade basis, with transfer of securities occurring at the same time as transfer of funds. This model is also used for settlement of JGBs, corporate and other bonds, and investment trusts. In this DVP scheme, funds settlements are executed on the BOJ-NET Funds Transfer System as follows: each time the Bank receives a payment instruction from JASDEC, the BOJ-NET 1) transmits funds settlement information to the payer and the payee; 2) upon a payment instruction from the payer, executes the funds transfer to the payee; and then 3) transmits a notice of funds settlement completion to JASDEC (Chart 2-8).

The introduction of DVP settlement for all types of securities and transactions will be accomplished in January 2009 with the start of DVP for primary market stock transactions,[27] and this move is expected to bring an even greater degree of stability to Japan's securities settlement systems.

Chart 2-8:
DVP settlement (Issuance)



3. Implementation of STP

The implementation of STP in securities settlement has been steadily proceeding, with the

[27] The DVP settlement for primary market transactions for stocks had been introduced successfully in January 2009.

service expansion of a pre-settlement and matching system and the setting up of system linkages between the pre-settlement and matching system and other securities clearing and settlement systems.

The JASDEC Pre-Settlement and Matching System provides electronic trade confirmation and settlement matching services for trading of securities among institutional investors and broker/dealers. The service began in September 2001 and has continued to expand its coverage of securities and types of services.[28] The JASDEC Pre-Settlement and Matching System plans to start services for foreign stocks in January 2009.[29] The JASDEC DVP Clearing Corporation (JDCC) also plans to offer clearing and DVP settlement services for foreign stocks beginning January 2009. The achievement of both these initiatives will realize STP for the entire lifecycle (from trade confirmation, clearing to settlement) of off-exchange trading of foreign stocks.

[28] The service initially started with stocks and expanded to convertible bonds (February 2002), investment trusts (May 2003), JGBs (May 2003), dematerialized CP, and corporate and other bonds (January 2006). From May 2004, the system has been linked to the JDCC system to achieve STP for clearing and DVP settlement of off-exchange stock transactions. From May 2005, it has been linked to the Japan Government Bond Clearing Corporation (JGBCC) system to achieve STP for clearing and DVP settlement of OTC trading of JGBs.

[29] The JASDEC Pre-Settlement and Matching System started the service for foreign stocks in January 2009, as was planned.

Chapter III: Business Continuity

A. Arrangements at the Bank of Japan

The Bank has undertaken several initiatives to enhance its business continuity arrangements so that it continues to fulfill its responsibilities with minimum impact on operations in the event of disaster.[30] The Bank prepares for natural disasters (e.g., earthquakes, winds, floods), technical disasters (e.g., system failures), man-made disasters (e.g., terrorist attacks), as well as other disasters such as pandemic outbreaks.

During 2007 and 2008, the Bank prepared necessary equipment and manuals for continuing critical operations at its alternative operational site in the event the Head Office in Tokyo is unable to operate. It also made further enhancements to its staffing arrangement to provide for quick response to manage disasters or other emergency situations. Enhancements were also made to the back-up arrangements of critical computer systems, for example, by additionally preparing back-ups for distributed server systems in locations away from the main center. The Bank is currently developing plans for pandemic influenza in line with the policy framework and guidelines developed by the government.[31]

In addition to these enhancements to its facilities and procedures, the Bank also worked to ensure that they work in practice. The Bank conducted various exercises including those aimed at: (1) testing the ability of Bank's Disaster Management Team to respond to disasters; (2) confirming the overall process of the switchover to the alternative operational site including relocation of staff and use of systems and equipment; and (3) familiarizing staff in Osaka with Head Office functions and operations to address situations where the Head Office becomes unavailable. With wide participation of online participants, the Bank also conducted BOJ-NET recovery exercises to test the switchover to the back-up system and its connectivity with participants. In addition, the Bank tested procedures for emergency communication with the government.

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[30] The "Policy Framework for Tokyo Inland Earthquakes," published by the government's Central Disaster Management Council in September 2005, requires institutions designated as "core economic function" including the Bank, to develop arrangements to recover critical financial and settlement functions within the day on which the earthquake occurs.

[31] See Ministry of Health, Labour and Welfare, "Guideline for Pandemic Influenza Preparedness at Business Entities and Establishments," (amended in August 2008). The English translation of the previous version published in March 2007 can be obtained at the Ministry's website.

B. Initiatives for Financial Institutions and Markets

In order to minimize the impact of disasters on the smooth operation of financial and economic activities, it is important to establish business continuity arrangements that cover the following three levels: (1) individual financial institutions; (2) financial markets; and (3) financial sector as a whole taking into account the interdependencies among financial institutions and with other sectors including public infrastructure.

The Bank encourages individual financial institutions to strengthen their business continuity planning by discussing relevant issues through on-site examinations, off-site monitoring and other opportunities, and also by publishing examples of good practices observed at institutions at home and abroad.[32] In recent years, financial institutions have put in place arrangements to cope with a wide range of disasters. However, there are still significant differences even within the business category on issues such as target recovery time of critical operations and staffing. It is desirable that financial institutions continue to enhance their business continuity arrangements commensurate to the roles that they play in the financial system and local economy.

As for the second perspective, business continuity in the financial markets, it is crucial that the network among market participants is maintained to ensure the functioning of the market. In the short-term money market, securities market, and foreign exchange market, a number of initiatives to strengthen market-level resilience were put in place. For example, participants of each market have agreed on the procedures for exchanging information in times of emergency. Possible changes to trading and settlement practices depending upon the level of damage and procedures for discussing and communicating those changes were also agreed.

Market participants have also conducted exercises to test the effectiveness of the arrangements. In the short-term money market, the Japanese Bankers Association, serving as the secretariat, organized market-wide exercises in September 2007 and February 2008, based around a simulated Tokyo inland earthquake and a large-scale flood, respectively. The exercises aimed to provide practical training for making use of the BCP website to

[32] See "Toward Effective Business Continuity Management: A Check list and Instructive Practices" (July 2008). The document is available on the Bank website (http://www.boj.or.jp/en/).

gather and provide information on the operational status of individual institutions and payment and settlement systems and to recommend temporary changes to market practices. As a part of these exercises, communication procedures were also tested between the Bank and relevant institutions. In the securities market, the JSDA served as the secretariat for the creation of a BCP website and for the first joint exercise held in October 2008. In the foreign exchange market, the Tokyo Foreign Exchange Market Committee, serving as the secretariat, created a BCP website which went live in January 2008. The first joint exercise using the website was held in July 2008 to test the process of consultation, information gathering, and information dissemination in times of disaster. The Bank participates in and actively supports the initiatives in each market with the view to ensuring smooth functioning of the market and ensuring safety and efficiency of payment and settlement systems.

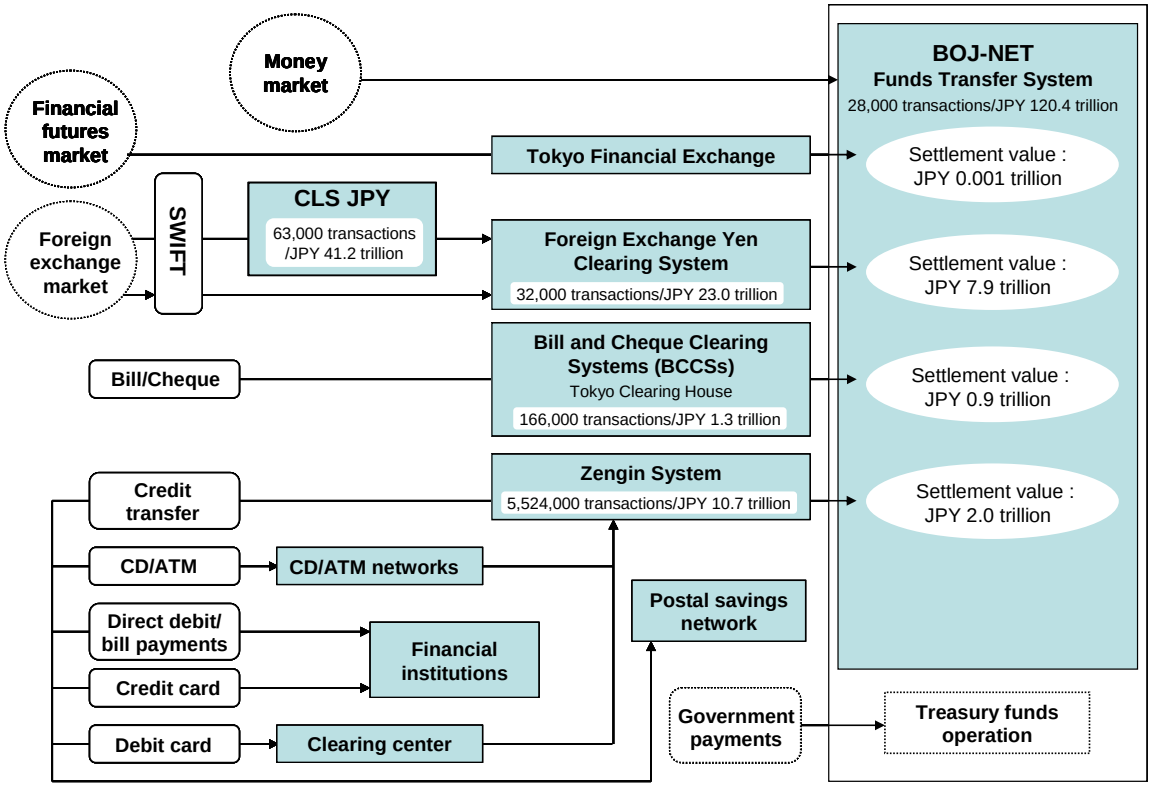
The above initiatives have provided a base for which the third perspective, business continuity for the financial sector as a whole, can be addressed. One useful approach to this is "street-wide exercise." This refers to the formulation of a specific disaster scenario for a joint exercise involving multiple financial institutions and all their business units (i.e., front, middle, and back offices). In other countries, street-wide exercises are often performed under the leadership of private-sector financial industry organizations, the central bank, or the government. Countries that have a history of this kind of exercise often expand beyond the financial sector to include electric power and gas providers, telecoms carriers, public transportation agencies and other providers of social infrastructure (Chart 2-9). Implementation of a street-wide exercise is one of the challenges to be addressed in strengthening the overall resilience of Japan's payment and settlement systems, financial markets, and financial institutions.

Chart 2-9:
Street-wide exercises conducted in selected countries

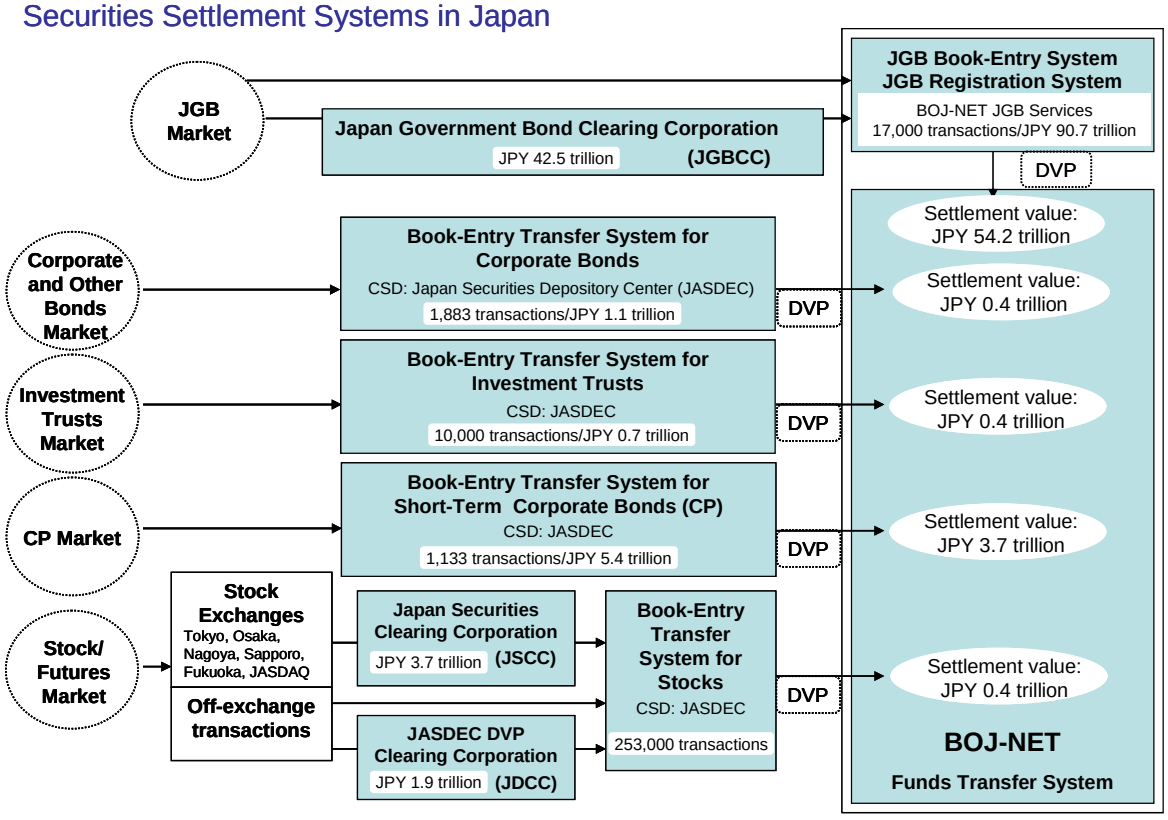
	Year	Exercise duration	Disaster scenario
United Kingdom	2003, 2004, 2005 2006	Half day 6 weeks	Terrorist attack Pandemic influenza
Singapore	2005, 2006 2008	Half day 2 weeks	Terrorist attack Pandemic influenza
United States	2007	3 weeks	Pandemic influenza
France	2008	Half day	Power outage

Annex: Overview of Payment and Settlement Systems in Japan

Payment Systems in Japan



Securities Settlement Systems in Japan



※Daily average for 2007. Figures for the CCPs show the amounts of settlement obligations accepted.