Japan's Next-Generation RTGS

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Abstract

In February 2006, the Bank of Japan decided to implement the neXt-Generation RTGS project (RTGS-XG) of the BOJ-NET Funds Transfer System. Under the RTGS-XG project, BOJ-NET will introduce liquidity-saving features. The new system will also incorporate large-value payments that are currently handled by two private-sector deferred net settlement systems, the Foreign Exchange Yen Clearing System and the Zengin System. The project will be implemented in two phases, with the first phase scheduled for fiscal 2008 and the second for 2011. This paper provides an overview of the project and discusses how it is expected to enhance the safety and efficiency of the settlement mechanism for large-value payments in Japan.

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I. Background

The BOJ-NET Funds Transfer System (BOJ-NET) is an interbank payment system for the Japanese yen operated by the Bank of Japan. The system is one of the core financial infrastructure supporting economic and financial activities in Japan. BOJ-NET settles more than JPY 100 trillion (USD 900 billion) daily, with annual turnover ranging as high as forty times Japan's nominal GDP.

Over the years the Bank has taken a number of measures to ensure that the settlement of the large value of payments in BOJ-NET takes place in a safe and efficient manner. One such measure was the conversion to a full-fledged real-time gross settlement (RTGS) system in January 2001. When it started live operation in 1988, BOJ-NET functioned as a deferred net settlement (DNS) system, settling on a net basis at designated times during the day. The movement to an RTGS system means that system achieves intraday finality and eliminates systemic risk associated with DNS by settling each payment instruction continually on a transaction-by-transaction basis.

The risk-reduction benefits of RTGS, however, come at the cost of increased liquidity requirements. Because payments are settled immediately in their full amount, RTGS requires larger amounts of liquidity compared with DNS, in which participants need to prepare only the amount of their net debit positions. Other things being equal, participants bear higher costs for settling a given value of payments in an RTGS environment. In addition, increased liquidity costs provide participants with incentives to deliberately delay the submission of payment instructions to the system in order to economize on the use of their own liquidity by relying on the incoming funds from other participants. If such behavior became widespread, it could lead to "gridlock" with multiple participants holding back their payments until they receive payments from others.

At present, such liquidity issues are mitigated in BOJ-NET largely due to the two measures that were implemented with the changeover to the RTGS system. First, since January 2001, the Bank extends intraday credit to participants without charge in the form of fully collateralised intraday overdrafts. In addition, participants have developed and observed market guidelines for submitting particular types of payments early in the day in order to achieve a certain level of throughput. For example, in the

call money market, it is encouraged that the borrowers return the call loans immediately after 9:00, which is when BOJ-NET opens, and no later than 10:00.

RTGS systems operating in many countries worldwide have similarly adopted various arrangements to address the trade-off between settlement risk and liquidity costs. More recently, innovative liquidity-saving features have become available and have been introduced in many RTGS systems, particularly in European countries.[1]

In Japan, there is also room to further enhance the safety and efficiency of large-value payment systems by improving system design. Against this background, in November 2005, the Bank released for public comment its proposal for the neXt-Generation RTGS project (RTGS-XG). The proposal was consistent with the views of market participants, who had conducted their own study on possible reform of large-value payment systems in Japan. While some commentators expressed concern with the technical aspects of the proposal, all supported the framework of the project.[2] On February 3, 2006, the Bank took the decision to implement the project.

Under the RTGS-XG project, the new BOJ-NET will have liquidity-saving features and will incorporate large-value payments that are currently handled by two private-sector DNS systems. Liquidity-saving features allow participants to economize on the use of liquidity while achieving intraday finality. Moving payment flows to BOJ-NET will allow a larger portion of large-value payments to be settled using an enhanced settlement mechanism, eliminating systemic risk associated with DNS.

II. Liquidity-saving features

The new liquidity-saving features will be provided on a new type of account as shown in Table 1. At present, there are two types of accounts that participants can open with the Bank, a standard account for pure gross settlement and a dedicated account for simultaneous processing of DVP and collateralisation (SPDC). Both of these accounts will continue to be available in the new BOJ-NET.[3]

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[1] The planned TARGET2 system will have liquidity-saving features similar to that of the new BOJ-NET, extending the use of such features to all countries participating in TARGET2.

[2] For example, one commentator expressed concern that the introduction of a new account for liquidity-saving features may complicate participants' account management process. The Bank of Japan intends to provide tools for monitoring the relevant accounts in an efficient way.

[3] The SPDC facility is another type of liquidity-saving facility used for the settlement of the cash legs of Japanese government securities transactions. It allows the receiver of Japanese government

Table 1: Account structure in the new BOJ-NET

	Standard account	SPDC account	New account
Types of transactions settled	- Transactions with BOJ/government - Settlement obligations arising from clearing systems - The cash legs of securities transactions - Interbank transfers (money market, FX) - Third-party transfers	- The cash legs of Japanese government securities transactions using the SPDC facility	- Interbank transfers (money market, FX) - Third-party transfers (including large-value Zengin payments)
Liquidity supply	Intraday overdrafts	Intraday overdrafts, liquidity transfer from standard account	Liquidity transfer from standard account
Liquidity saving	Not applicable (pure RTGS)	SPDC	Queuing and offsetting mechanisms
Account management	Overnight	Intraday (zero balance at the end of the day)	Intraday (zero balance at the end of the day)
Opening and closing times	9:00-17:00*	9:00-16:30	9:00-16:30

*Closing time is 19:00 for participants that have applied for access to extended hours.

Liquidity saving will be achieved by centralised queuing and offsetting mechanisms available in the new account facility in BOJ-NET. Queuing allows payment instructions to be held pending within the system for offsetting. For example, in today's BOJ-NET, if a participant sends a payment instruction but does not have sufficient funds to complete the transaction, it is 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. Participants will be able to monitor and interactively manage their queued instructions, for example by reordering instructions to facilitate settlement.

Added to this are two offsetting mechanisms. An offsetting mechanism searches for a set of payment instructions that can be settled when taking into account incoming payments as source of liquidity, and settles the selected instructions simultaneously. In this process, each payment instruction is settled on a gross basis, and individual obligations are not replaced by a net obligation. In the new BOJ-NET, a bilateral

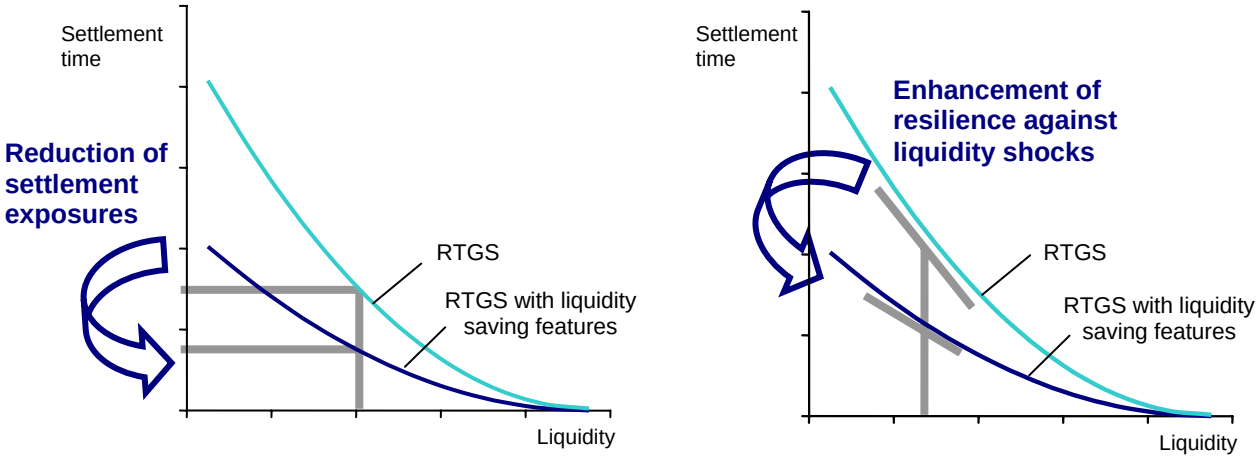
securities to pledge the incoming securities as collateral for intraday overdrafts, while using the overdrafts to pay for those incoming securities. Similarly, the deliverer of Japanese government securities is able to withdraw the securities pledged with the Bank of Japan for delivery to the receiver, while using the funds received to repay the overdrafts.

offsetting algorithm will run continuously throughout the day, with a multilateral offsetting algorithm running a few times a day to complement the bilateral offsetting algorithm (see Box 1 for a detailed description).

The new liquidity-saving features will have both micro- and macro-level benefits. At a micro level, the offsetting mechanisms provide participants with opportunities to economize on liquidity without waiting for incoming funds from other participants. As a result, the new design can weaken the incentive for participants to delay sending payment instructions to the system and prevent "gridlock."

At a macro level, with a given amount of available liquidity, an RTGS system with liquidity-saving features can achieve earlier settlement compared with a system that does not have such features. In other words, intraday exposures can be reduced without increasing liquidity costs (see the left diagram in Chart 1). To put it another way, an RTGS system with liquidity-saving features requires less liquidity to achieve a given level of intraday exposure. This makes the system more resilient to unexpected liquidity shortages within the system that may occur, for example, due to an operational problem at one or more participants (see the right diagram). These macro-effects are more prominent where the level of available liquidity is lower.

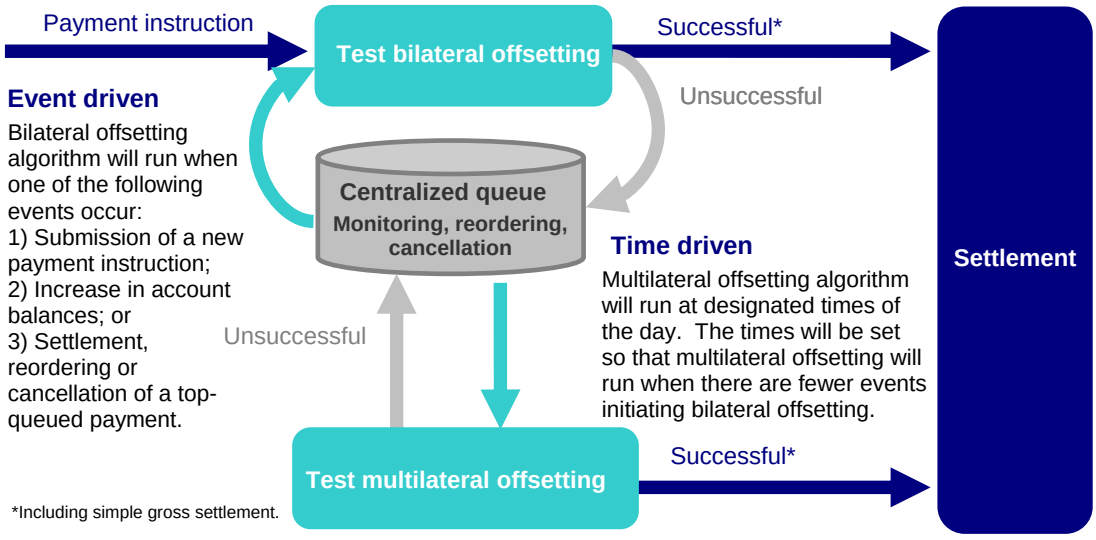
Chart 1: Potential effects of liquidity saving features



Box 1
Settlement process with liquidity-saving features

The chart below shows the settlement process in the new type of account in the new BOJ-NET. The bilateral offsetting algorithm will search for a pair of offsetting payment instructions or a single instruction that can be settled on a gross basis. It will run when one of the following events occur: (i) a new payment instruction entering the system; (ii) an increase in balances; and (iii) a change in the payment instruction at the top of the queue. The target payment instruction for bilateral offsetting is the newly submitted payment instruction when (i) occurs, and the top-queued payment instruction when (ii) or (iii) occurs. For example, where the target payment instruction is a newly submitted payment from Bank A to Bank B, the system searches from the top of the queue for a payment instruction from Bank B to Bank A that can be settled simultaneously using available balances.

The multilateral offsetting algorithm will run at fixed times. It will attempt to find the largest set of queued payment instructions that can be settled using available balances by first testing to settle all queued payment instructions at once, and successively removing the largest queued payment instruction from the participant with the largest funding shortfall until a set of payment instructions that causes no funding shortfalls can be found.

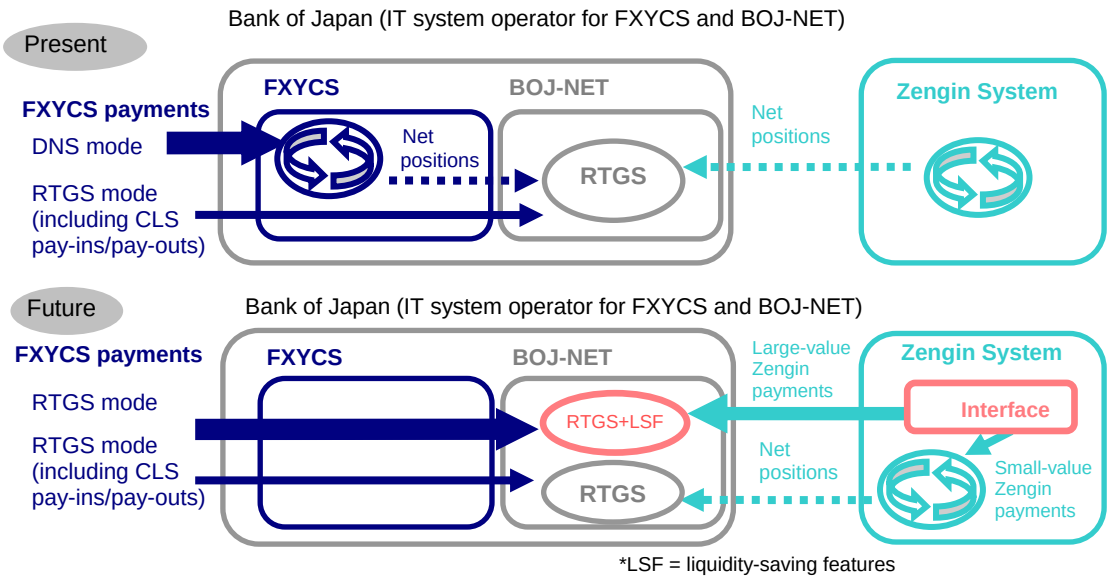


III. Moving payment flows to BOJ-NET

As well as introducing liquidity-saving features, BOJ-NET will bring in payments processed at present in other systems. In Japan, there are two systems other than BOJ-NET that process large-value payments.[4] These are the Foreign Exchange Yen Clearing System (FXYCS), which handles the yen legs of foreign exchange transactions, and the Zengin System, which handles retail credit transfers, including those of large value. Both are DNS systems operated by the private sector and use BOJ-NET for the final settlement of net positions.

Under the RTGS-XG project, large-value payments currently settled in the two systems will be incorporated into the new BOJ-NET (see Chart 2). All payments sent to FXYCS will be forwarded to the new BOJ-NET, while the designated-time net-settlement mode of FXYCS will be abolished. Large-value payments sent to the Zengin System will be forwarded to BOJ-NET for settlement through the new account. Retail credit transfers of smaller value will continue to settle on a deferred net basis in the Zengin System.

Chart 2: Planned changes in payment flows

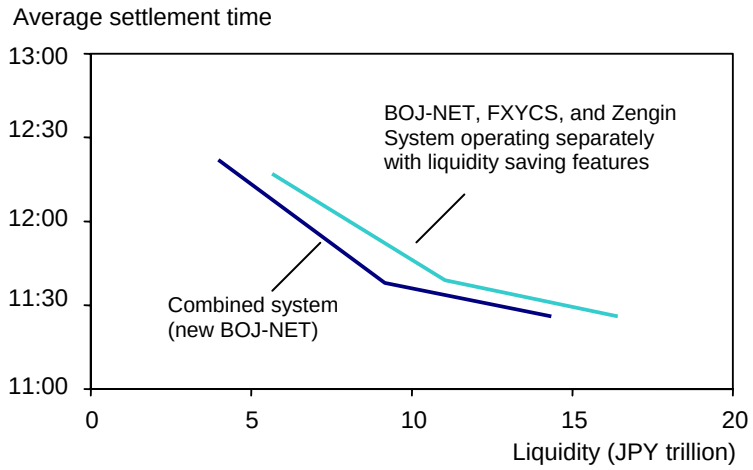


By incorporating payment flows from FXYCS and the Zengin System into BOJ-NET, large-value payments that are currently settled on a net basis at the end of day will become final in the course of the day, eliminating systemic risk associated with DNS.

[4] For an overview of payment systems in Japan, see the section on Japan in Bank for International Settlements (2003), *Payment and Settlement Systems in Selected Countries.*

At the same time, the movement of payment flows to BOJ-NET will achieve economies of scale in liquidity usage. As there are potentially offsetting payments across *all three* systems, liquidity-saving effects will be greater in the combined system than in a situation where each system *separately* adopted intraday finality with liquidity-saving features (see Chart 3).

Chart 3: Potential effect of combining payment flows



The potential effects of these two aspects of the RTGS-XG project on the duration of settlement exposures and the required amount of liquidity were studied in a simulation analysis.[5] Today, large-value payments settled in BOJ-NET, FXYCS, and the Zengin System, which could be settled using liquidity-saving features in the new BOJ-NET, total JPY 70 trillion daily. As indicated in the chart in Box 2, to settle those payments separately in each system, it currently requires JPY 14 trillion with an average duration of four hours. With the introduction of the liquidity-saving features and the shift of payment flows to the new BOJ-NET, it is estimated that average duration can be reduced by one hour even when the amount of liquidity is reduced by half.

IV. Moving forward

The RTGS-XG project involves changes to a wide range of areas, including the rules and IT infrastructure of BOJ-NET, FXYCS and the Zengin System. As indicated in Table 2 below, to allow for adequate preparation by relevant parties and to minimise

[5] For a detailed discussion on potential effects of the RTGS-XG project, see Imakubo, K. and J. McAndrews (forthcoming), "Funding Levels for the New Accounts in the BOJ-NET," Bank of Japan Working Paper Series.

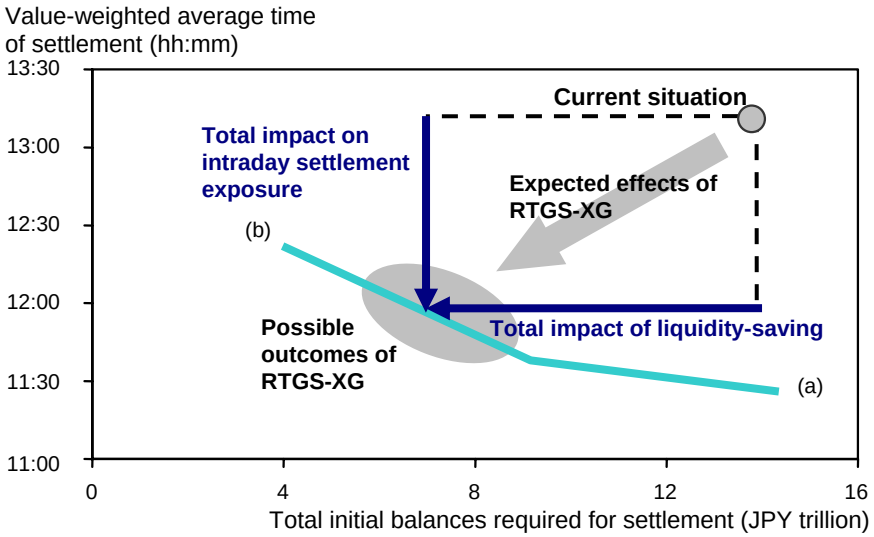
the risk associated with changeover in multiple systems, the Bank will implement the project in two phases. The Bank plans to introduce liquidity-saving features into BOJ-NET and incorporate payments handled in FXYCS into the new BOJ-NET during fiscal 2008 (April 2008–March 2009). Large-value payments handled in the Zengin System will be incorporated into BOJ-NET around 2011.

Table 2: Timeline for RTGS-XG as of October 2006

November 2005	Consultation paper published
February 2006	Decision to implement the project
June 2006	Announcement of preliminary functional specification
October 2006	Announcement of revised functional specification
End 2006	Announcement of final functional specification
2008	Participant testing
	Phase 1: introduction of liquidity-saving features and incorporation of FXYCS payments into BOJ-NET
2011	Phase 2: incorporation of large-value Zengin payments into BOJ-NET

One factor that would affect the level of risk and cost reduction actually achieved from the project is the behavior of participants using the new system. In particular, it is important that each participant maintains an appropriate level of liquidity in the system and manages their payment instructions to facilitate settlement in the new environment. At present, market participants are discussing possible best practices to be implemented with the introduction of liquidity-saving features.

Box 2
Performance under the current and new BOJ-NET



Source: Imakubo and McAndrews [forthcoming].

The chart above shows the results of simulation analysis on settlement performance under the current and new BOJ-NET. Points in the lower-left corner of the chart are more desirable combinations of total initial balances and settlement time.

At the point "Current situation," money market transactions are settled in BOJ-NET on an RTGS basis; foreign exchange yen payments in FXYCS on a DNS basis; and large-value retail credit transfers in the Zengin System on a DNS basis.

The curve joining points (a) to (b) shows the relationship between total initial balances and settlement times in the new BOJ-NET. Point (a) endows participants with sufficient liquidity to settle the day's payments without delay. Point (b) endows participants with sufficient liquidity to settle only their multilateral net debit positions.

The range of "Possible outcomes of RTGS-XG" shows that, with the introduction of the liquidity-saving features and the movement of payment flows to the new BOJ-NET, the total initial balances can be reduced by half while reducing the average duration by one hour.

The simulations performed to achieve these results used historical data from BOJ-NET, FXYCS, and the Zengin System. Because of this, timing of submission of instructions is subject to the constraints under the current arrangements (e.g., liquidity constraints for money market transactions, net credit limits in FXYCS and the Zengin System).