

The Effects of a Disruption in CDSX Settlement on Activity in the LVTS: A Simulation Study

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A safe and efficient payments system is critical to the smooth functioning of the financial system. In Canada, the Large Value Transfer System (LVTS), for time-sensitive payments that are typically large-value payments, and CDSX, for the clearing and settlement of debt and equity securities, are two of the systems that have been designated as systemically important under the Payment Clearing and Settlement Act.¹ The operations of these systems are closely linked. For example, many LVTS participants are also CDSX participants, and end-of-day funds exchange relating to CDSX settlement occurs through the LVTS.

Given this link, a disruption to CDSX settlement could potentially have a significant impact on LVTS activity. By monitoring their CDSX activity, LVTS participants can anticipate what their CDSX settlement position will be and whether they will receive a CDSX pay-out. Therefore, the participants take into account their expected CDSX funds when planning their LVTS activity throughout the day. An unexpected event that disrupts CDSX settlement could affect end-of-day activity in the LVTS.

The importance of this link between the two settlement systems has long been recognized by system participants, system operators, and the Bank of Canada. In our study (Embree and Millar 2008), we try to quantify the potential impact of an operational event affecting CDSX settlement. Specifically, we simulate an event that prevents CDSX settlement pay-outs from being completed. Many possible events could disrupt CDSX settlement in this way: for example, events affecting the operator of CDSX, the system participants, or the Bank of Canada. We find that

such an event can have important potential impacts. There are, however, a number of mitigating actions and contingency measures to prevent such disruptions and reduce the impact should they occur.

CDSX and LVTS

Throughout the day, debt and equity trades and related entitlement payments (e.g., maturities and dividends) are settled in CDSX. At the end of the day, CDSX participants must settle their net funds position through the LVTS. The Bank of Canada is the settlement agent for the CDS Clearing and Depository Services Inc. (CDS), the owner and operator of CDSX. The Bank receives, through the LVTS, all the CDSX payments from those participants in negative CDSX funds positions. The Bank then makes the payouts to those in positive positions through the LVTS.² CDSX settlement is usually completed by 17:05.³ After CDSX settlement occurs, important LVTS payment activity continues, as LVTS participants make payments for about an hour on behalf of their clients or their own business. This is followed by a pre-settlement period, between 18:00 and 18:30. LVTS settlement begins at 18:30.

Data and Methodology

The LVTS has two payment streams, Tranche 1 (T1) and Tranche 2 (T2). Each tranche is characterized by its own risk controls. Since CDSX settlement takes place through T1, our study focuses on T1. The study makes use of payment-

1. For more information on CDSX, see McVanel (2003). For more information on the LVTS, see Arjani and McVanel (2006).

2. Participants can draw on liquidity in CDSX prior to CDSX settlement through a CDSX-LVTS funds transfer. Anecdotal evidence suggests that this transfer is not used frequently.
3. All times are in Eastern Standard Time.

by-payment transactions data and intraday credit-limit data obtained from the Canadian Payments Association, as well as payment instructions regarding the CDSX settlement account held at the Bank of Canada. Our simulation spans the 65 business days from 1 June 2006 to 31 August 2006.

Our data suggest that the value of the CDSX pay-outs and subsequent LVTS T1 activity is a significant portion of the total daily T1 activity. Over the sample period, there were, on average, seven CDSX pay-outs each day worth \$3.5 billion. This represents 2 per cent of the average daily T1 volume and 16 per cent of the average daily T1 value of \$21 billion. The largest settlement pay-out to a single CDSX participant was \$7 billion, while the daily maximum to all participants was over \$16 billion. In addition, after CDSX settles, there continues to be considerable LVTS activity, with a daily average of 17 payments of \$2.6 billion. This represents approximately 12 per cent of the daily average T1 value. During the sample period, up to 37 payments worth a total of \$10.8 billion were sent after CDSX settlement.

The main approach used is a simulation employing the payments system simulator (BoF-PSS2) developed by the Bank of Finland and adapted to replicate LVTS conditions.⁴ The simulator allows us to use LVTS and CDSX data to recreate actual LVTS activity and to use this as a benchmark. We then identify and remove the CDSX pay-outs, without removing the pay-ins, and simulate the LVTS with these payments removed. In effect, this simulates a situation where the CDSX pay-outs are not completed. For example, an event affecting the Bank of Canada between pay-ins and pay-outs could result in the type of event simulated. It is important to note that the simulation does not incorporate mitigating strategies, such as alternative payment methods, that can be used to circumvent, or at least reduce, the effect of such an event. The simulation presents a possible worst-case scenario.

Results

We find that the simulated outage results in some LVTS payments being unable to settle during the day, and some payments being temporarily

delayed. In addition, we find that pre-settlement activity in the LVTS may be disrupted.

Our results indicate that a disruption to CDSX can lead to payments that cannot settle. Unsettled payments occur on 32 of the 65 days simulated. We examine how important the CDSX funds are for end-of-day LVTS payment activity on the days with unsettled CDSX payments. First, we calculate the value of unsettled LVTS payments as a share of the CDSX pay-outs. We find that, on average, the value of payments that are unable to settle is equal to 27 per cent of the CDSX pay-outs. On some days, this value can be over 80 per cent. Second, we assess how much of the LVTS payments that are sent after CDSX settlement at 17:05 are affected by the simulated disruption. We find that, on average, 36 per cent of the T1 payments made after 17:05 are unable to settle.

The simulated outage also results in a substantial increase in the delay of LVTS payments. Payments that are unable to pass the risk controls when they are submitted may be entered into a queue.⁵ While some queued payments can subsequently be settled, they are delayed. We therefore examine queue usage to understand the delay caused by the outage. In the base case, where CDSX settlement occurs, the queue is used on 6 of the 65 days, and in the simulated CDSX outage, the queue is used on 39 days.

We also find that a disruption to CDSX settlement will likely affect LVTS pre-settlement activity. Pre-settlement transfers allow participants to bring their end-of-day LVTS position close to zero, by making interbank payments. Pre-settlement payments are made between 18:00 and 18:30. During the pre-settlement period, LVTS participants with a positive position lend to those in a negative position in order to bring their positions close to zero. Receipt of a CDSX pay-out may cause some participants to have a positive LVTS balance, allowing them to lend to participants in negative positions. Some interbank activity to bring positions close to zero can take place prior to the pre-settlement period. By examining pre-settlement payments, we find that institutions that did receive CDSX pay-outs are, in fact, making most of the payments during the pre-settlement period. For instance, on 35 of the 65 days, over 70 per cent of the pre-settlement

4. For more information, see the Bank of Finland's payment simulator website at <<http://www.bof.fi/en>>.

5. For more information on the LVTS payment queue, see Arjani and McVanel (2006).

payments were made by recipients of CDSX pay-outs.

Contingency Measures and Mitigating Actions

Contingency measures are in place that can be implemented to prevent CDSX settlement from being delayed. While events affecting CDSX settlement do happen, they are infrequent and of short duration. To ensure that important payments can be made during operational disruptions, CDS, the LVTS, system participants, and the Bank of Canada have contingency measures in place to safeguard their operations. These measures include making payments using alternative payment methods, such as the LVTS direct network, and moving operations to an alternate site.⁶ These measures help to ensure that any event that may prevent CDSX settlement from being completed is managed quickly, and that the CDSX settlement payments can be made with little or no delay.⁷

Furthermore, if an event does lead to a delay in CDSX settlement pay-outs, LVTS participants can take actions to mitigate the impact of the delay. Our analysis of past operational events suggests that LVTS participants apportion additional collateral to T1 and move payments to the T2 payment stream when CDSX settlement is delayed.⁸

Conclusions

The completion of CDSX settlement through the LVTS creates an important operational link between these two systemically important systems. Our analysis demonstrates that a disruption to CDSX settlement can potentially have important effects on end-of-day activity in the LVTS. In the unlikely scenario that the CDSX settlement funds are not available and mitigating action is not taken, a significant number of

payments would be unable to settle or would be delayed. In most cases, the participants would take action to mitigate these impacts; for example, they may move payments to T2 or apportion additional collateral. Moreover, CDS, LVTS system participants, and the Bank of Canada could employ contingency measures to ensure the completion of CDSX settlement. The results of this study highlight the importance of well-designed systems and procedures, including contingency measures and mitigating actions, to safeguard the payments system.

References

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6. For more information on the LVTS direct network and other contingency measures, see the LVTS Rules available on the Canadian Payments Association's website.
7. For more information on the Bank of Canada's contingency plans, see Allenby (2003).
8. Participants could implement other mitigating actions that are difficult to analyze, such as changing the order in which they submit payments so that liquidity can be used more efficiently.