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Examining the Costs of Increased Collateral Coverage in the Large Value Transfer System*

Bank of Finland Simulator Seminar
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*Preliminary results.
Views expressed do not necessarily represent the Bank of Canada.

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Outline

1. Introduction
2. Motivation
3. LVTS Overview
4. Methodology, Results & Implications

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Introduction

- LVTS is equivalent to a real-time gross settlement system (RTGS)
- We use the BoF Simulator to simulate fully collateralized LVTS payments, similar to an RTGS
  - Purpose: Estimate change in collateral requirements
- Also include queuing to reflect potential liquidity savings

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High-level results

- On average, the increase in collateral requirements could be covered by participants' existing collateral if including "excess" collateral
- Some participants could face lower collateral requirements

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Motivation

CPSS-IOSCO Principles for Financial Market Infrastructures

An FMI should maintain sufficient financial resources to cover its credit exposure to each participant fully with a high degree of confidence.

✓ LVTS observes the Credit Risk Principle because of the Bank's residual guarantee

Planning for the "Next Generation" payments system is also underway

5

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Large Value Transfer System (LVTS)

Key Points

- Canada's RTGS-equivalent system for interbank payments
  - Payments final and irrevocable
  - Multilateral net settlement end of day
- 16 direct participants, including Bank of Canada
- Two payment streams
- Always sufficient collateral to cover single largest default
- Bank of Canada residual guarantee

6

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Tranche 1 Payments

Participants pledge collateral to the Bank to determine their T1 intraday credit limit (dollar-for-dollar)

Fully Collateralized

- Similar to an RTGS

Defaulter pay

- The Bank would seize the defaulter's collateral to cover its T1 net debit position

7

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Tranche 2 Payments

Participants extend bilateral credit limits (BCL) to one another

Partially collateralized

- Participants pledge collateral to the Bank equal to 30% of the largest BCL they extended

Multilateral credit limit determined by BCLs received

- 30% x ∑ BCLs received

Survivors pay

- Collateral pool is sufficient to cover single largest default
- Defaulter's collateral seized first
- Survivors pay additional settlement obligation proportional to the credit they extended the defaulter

8

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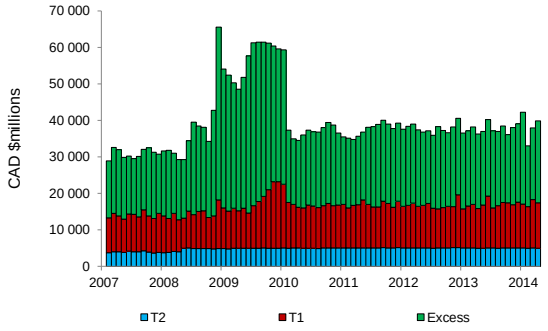
Collateral Allocation

- Participants allocate collateral to T1, T2 and "excess"
- Excess collateral not part of LVTS collateral pool



Source: BoC data for April 2014

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Average Daily Payments

- T2 payments more collateral efficient than T1

Average Daily	T1	T2	Total
Value	$39b	$115b	$154b
Volume	403	32,797	33,200
Collateral pledged	$12b	$5b	$17b
Collateral per $payment	$0.32	$0.04	$0.11

Source: BOC and CPA data for April 2014.
Values in CAD.

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Jumbo Queue

- Payments that cannot pass risk control tests and exceed a threshold value ($100m) are placed in T1 or T2 queue
- Queued payments re-tested when:
  - a payment is received and/or credit increases
- Jumbo queue algorithm
  - FIFO netting algorithm runs every 15 minutes.
- Unsettled payments rejected after 35 minutes
- Participants encouraged to not rely on the central queues

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Residual Guarantee

- The Bank is responsible for ensuring LVTS will settle under <u>all</u> circumstances.

- The Bank provides an explicit guarantee (enshrined in legislation) to settle the system if there are
  - multiple defaults on the same day *and*
  - the collateral pool is insufficient to cover the shortfall

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Methodology

- BoF Simulator modified for LVTS design and risk controls
- Submit all LVTS payments in T1 (i.e., move T2 payments to T1)
- Estimate daily change in collateral requirements for each participant
- Sample period: July - December 2013 (126 days)

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Methodology

Base Case	Case 1 Simulation	Case 2 Simulation
▪ Historical data for comparison ▪ Payments in T1 and T2	▪ All payments in T1 ▪ No credit limits → Payments settle when submitted → Simulated collateral required: largest net debit position	▪ All payments in T1 ▪ Credit limits = T1+T2 collateral pledged in base case ▪ All payments, regardless of value, eligible for the queue → Allow queuing for liquidity management → Simulated collateral required: largest net debit position + coverage of rejected payments

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Main Caveat

- Simulations based on historical data and do not reflect expected change in payment behaviour. Presumably, participants would
  - Re-order payments to make better use of incoming funds
  - Increase payment coordination with other participants
  - Rely on queue
- Results are rough estimates that may motivate future research

15

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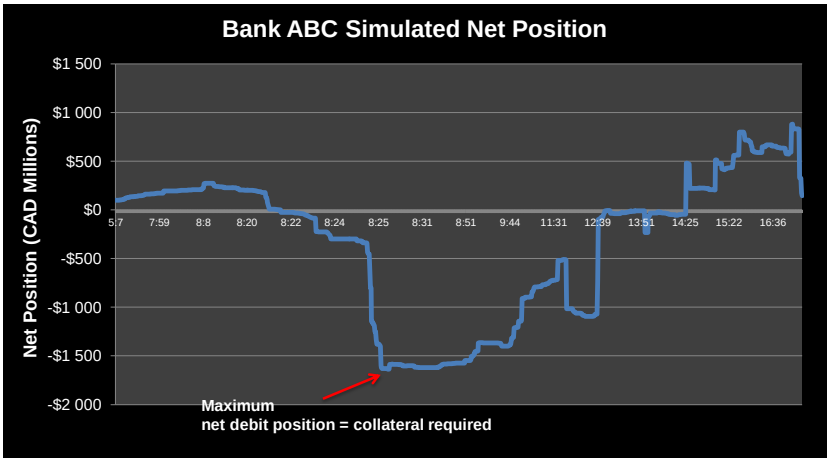
Methodology: Case 1



16

Source: Simulated net debit position for 03 July 2013.

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Methodology: Estimate Change in Collateral

$$\Delta\text{Collateral} = \underbrace{(\text{Simulated Max NDP})}_{\text{Case 1}} - \underbrace{(\text{Max T1 NDP+T2 Collateral})}_{\text{Base Case}}$$

Participants may require less collateral in Case 1 if

- combining T1 and T2 payments results in improved netting and the participant's net position does not go as far negative, and/or
- base case T2 collateral is high given actual payments sent

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Simulation Results: Case 1

- On average, collateral required in Case 1 is greater than base case

Δ Collateral	Average Daily	Minimum	Maximum	St. Dev
System	+$413m	-$12.5b	$9.5b	$1.2b
Big 6	+$799m	-$12.5b	$9.5b	$1.6b
Small (9)	+$154m	-$3.3b	$2.2b	$534m

- Larger participants more likely to face increase in collateral required

	% of Days Increased	Average Daily Increase	Minimum Increase	Maximum Increase	St. Dev
Big 6	80%	$1.3b	$12.6m	$9.5b	$1.0b
Small (9)	47%	$488m	$393k	$2.2b	$565m

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Simulation Results:
Case 1 Collateral as a % of Base Case Collateral

- Case 1 collateral requirements would require use of Excess collateral

	% of Base Case Collateral	% Base Case Collateral Including Excess	% Days Excess Collateral Sufficient
Big 6	165%	62%	93%
Small (9)	95%	46%	91%

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Simulation Results: Collateral Per $ Payment

Bank*	Case 1	Base Case	Difference
A	$0.35	$0.12	$0.23
B	$0.34	$0.13	$0.21
C	$0.40	$0.20	$0.20
D	$0.16	$0.08	$0.08
E	$0.13	$0.07	$0.06
F	$0.09	$0.06	$0.03
G	$0.23	$0.21	$0.02
H	$0.08	$0.08	$0.00
I	$0.21	$0.21	-$0.01
J	$0.16	$0.17	-$0.01
K	$0.11	$0.19	-$0.08
L	$0.21	$0.30	-$0.09
M	$0.22	$0.36	-$0.15
N	$0.08	$0.53	-$0.45
Average	$0.20	$0.19	$0.00

* Big 6 banks denoted in blue font.

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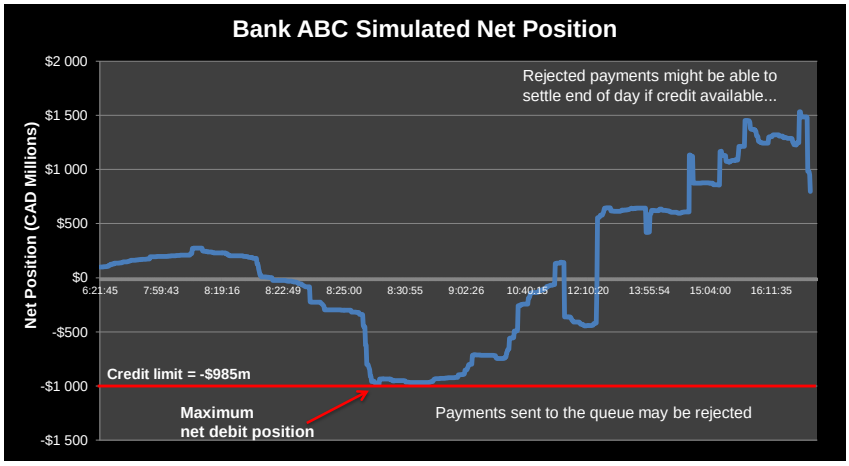
Methodology: Case 2



Source: Simulated net debit position for 03 July 2013.

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Methodology: Estimate Change in Collateral

$$\Delta \text{ Collateral} = \underbrace{(\text{Simulated Max NDP})}_{\textbf{Case 2}} + \underbrace{(\text{Simulated Rejected})}_{\textbf{Case 2}\ \text{Collateral for Rejected Payments}} - \underbrace{(\text{Max T1 NDP} + \text{T2 Collateral})}_{\textbf{Base Case}}$$

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Methodology: Collateral for Rejected Payments

- Payments that do not pass initial risk controls enter a FIFO by-pass queue
  - Payments rejected from the queue if not settled within 30 minutes
- To estimate collateral required for rejected payments, check if the rejected payments could settle at the end of day:
  - If **yes**, no additional collateral needed
  - If **no**, the value that exceeds the position and credit would need to be collateralized

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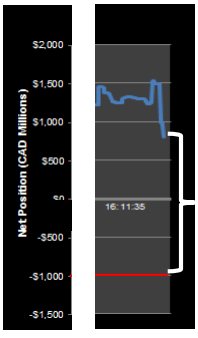
Methodology: Collateral for Rejected Payments



Available credit

- Rejected payments could settle at end of day up to the value of available credit.
- If this EOD credit insufficient, additional collateral needed to settle the rejected payments.

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Rejected Payments

	Value of Rejected Payments (Average Daily)*	Collateral for Rejected Payments (Average Daily)*	% Days Rejected Fully Covered by EOD Credit
System	$584m	$429m	66%
Big 6	$1.1b	$615m	67%
Small (9)	$211m	$156m	65%

*Including zeroes.

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Simulation Results: Case 2

- On average, less collateral required than Case 1

Δ Collateral	Average Daily	Minimum	Maximum	St. Dev
System	+$180m	-$12.5b	+$8.2b	$1.1b
Big 6	+$457m	-$12.5b	+$8.2b	$1.6b
Small (9)	-$4.3m	-$3.2b	+$3.5b	$337m

- Fewer days of increase than Case 1 and smaller average increase

	% of Days Increased	Average Daily Increase	Minimum Increase	Maximum Increase	St. Dev
Big 6	72%	$1.1b	$212	$8.2b	$1.3b
Small (9)	37%	$204m	$70k	$3.5b	$378m

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Simulation Results:
Case 2 Collateral as % of Base Case Collateral

- Case 2 collateral requirements less likely to require use of Excess collateral

	% of Base Case Collateral	% Base Case Collateral Including Excess	% Days Excess Collateral Sufficient
Big 6	116%	45%	95%
Small (9)	69%	34%	97%

27

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Simulation Results: Collateral Per $ Payment

Bank*	Case 2	Base Case	Case 2 Difference	Case 1 Difference
A	$0.14	$0.12	$0.02	$0.23
B	$0.12	$0.13	-$0.01	$0.21
C	$0.39	$0.20	$0.20	$0.20
D	$0.13	$0.08	$0.05	$0.08
E	$0.10	$0.07	$0.02	$0.06
F	$0.08	$0.06	$0.02	$0.03
G	$0.22	$0.21	$0.01	$0.02
H	$0.10	$0.08	$0.02	$0.00
I	$0.14	$0.21	-$0.07	-$0.01
J	$0.19	$0.17	$0.02	-$0.01
K	$0.10	$0.19	-$0.09	-$0.08
L	$0.22	$0.30	-$0.08	-$0.09
M	$0.13	$0.36	-$0.23	-$0.15
N	$0.09	$0.53	-$0.44	-$0.45
Average	$0.15	$0.19	-$0.04	$0.00

* Big 6 banks denoted in blue font.

28

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Implications

- Impact varies by participant
- Queuing reduces collateral needs through more efficient netting
- The increase in collateral requirements is manageable when compared to total collateral pledged, including excess

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Questions for further consideration

- Who should bear the cost of sending payments?
- Given participant's existing collateral demands, how would stakeholders (BoC, CPA, participants) view the changes in collateral requirements?

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Thank you!

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