

Liquidity risk in Securities Settlement

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Motivation

- ❑ Contagion in SSSs possible (e.g. Sept 11)

- ❑ Studies of contagion limited
 - Payment systems vs. SSSs
 - Real stress tests

- ❑ SSSs are different
 - Securities leg ⇒ -cash liquidity is not enough
 - Settlement lag ⇒ -need to form expectations
-disruption lasts more than one day

What we do

- ❑ Develop a methodology ...
 - Multiple-period model, multiple securities

- ❑ to assess the impact of a "stress event" ...
 - Default of the largest participant

- ❑ on liquidity risk...

- ❑ from a system wide perspective.
 - Look at settlement efficiency and trade volume

Liquidity risk and settlement efficiency

□ Liquidity risk

- *"the risk that a counterparty will not settle an obligation for full value when due, but some unspecified date thereafter"* (BIS, 1992).

□ Settlement efficiency as a proxy for liquidity risk

- Ratio of trades settled over total trades (in values)
- Also examine volume of trades after disruption

Questions addressed

- ❑ What are the dynamic effects (direct and contagion) on settlement of a major disruption?
- ❑ How does first-day impact compare with impact in subsequent days?
- ❑ How many days does it take before settlement efficiency returns to its "normal" level?
- ❑ How important is liquidity for avoiding problems?

Outline

- ❑ Existing literature
- ❑ Stylised example
- ❑ Model description
- ❑ Simulation results
- ❑ Conclusions

Existing literature

❑ Interbank market

- Solvency: Upper and Worms (2002), Furfine (2003), Degryse and Nguyen (2004)

❑ Payment systems

- Liquidity: Humphrey (1986), Angilini, Maresca and Russo (1996), Northcott (2002)
- Net vs. gross settlement: Kahn, Mcandrews and Roberds (1999), Leinonen and Soramaki (1999)

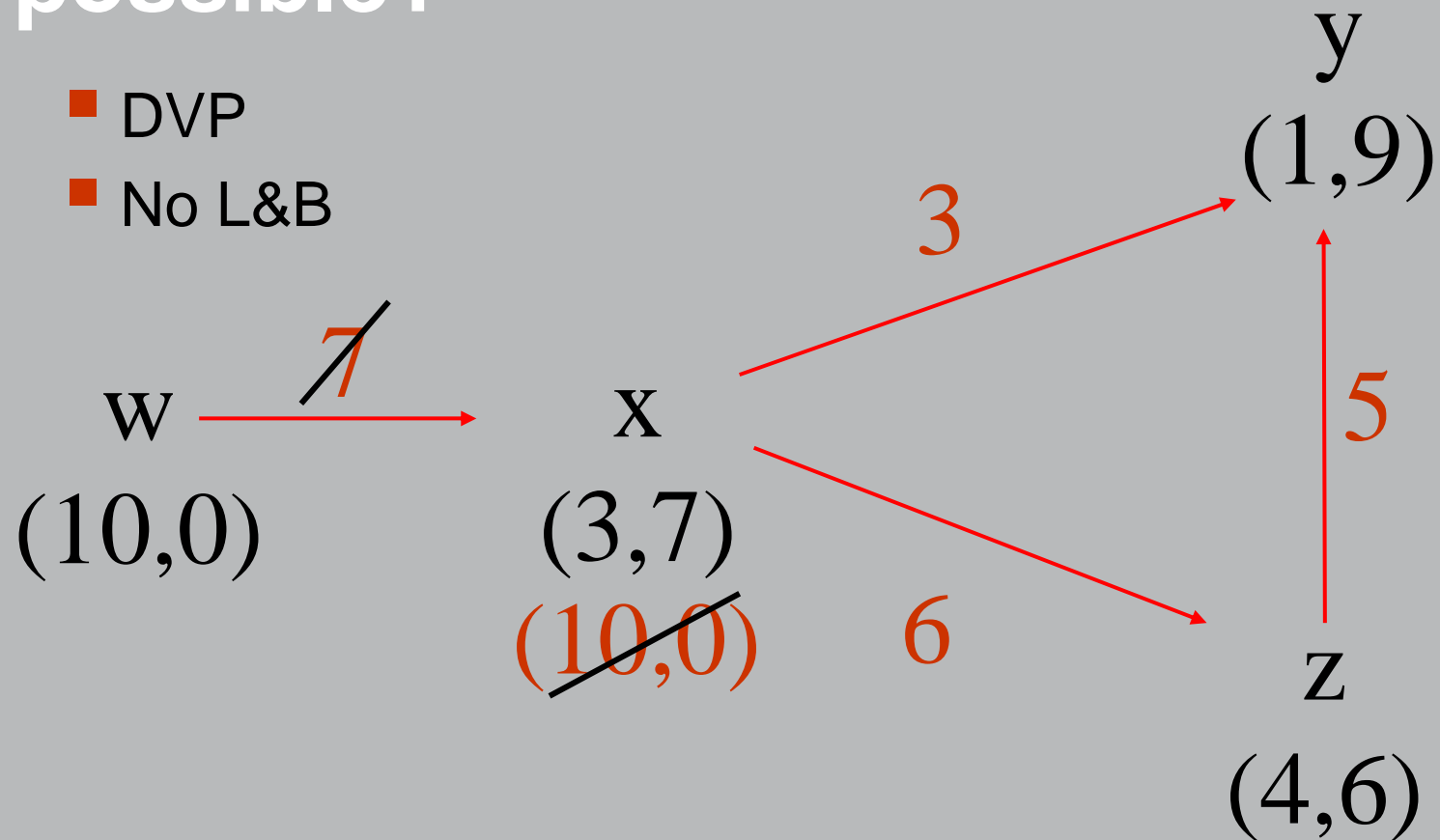
⇒ Intraday liquidity solves all problems

❑ Securities settlement

- Operational risk: Iori (2004)

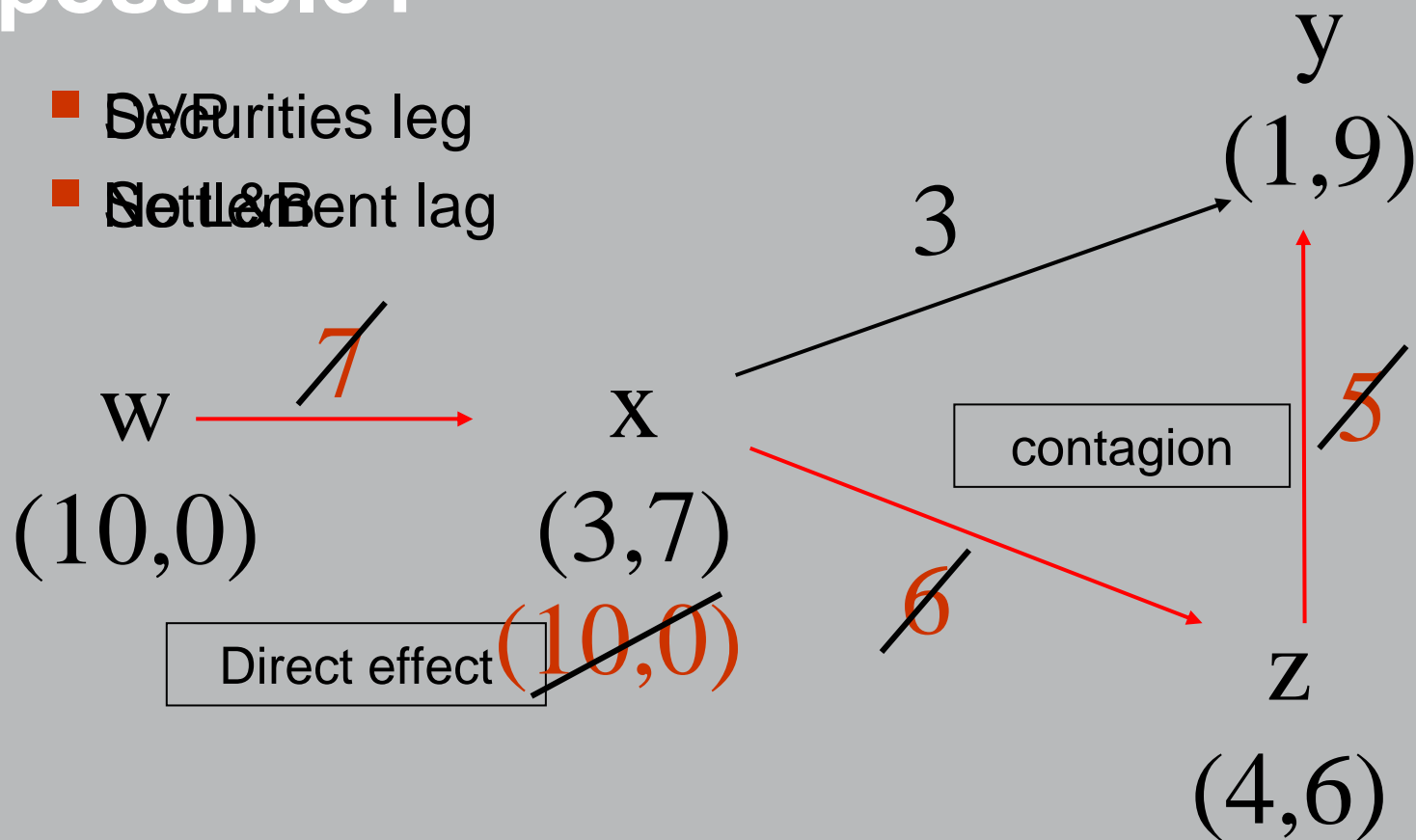
Why are settlement failures possible?

- DVP
- No L&B



Why are settlement failures possible?

- DVP Purities leg
- Settlement lag



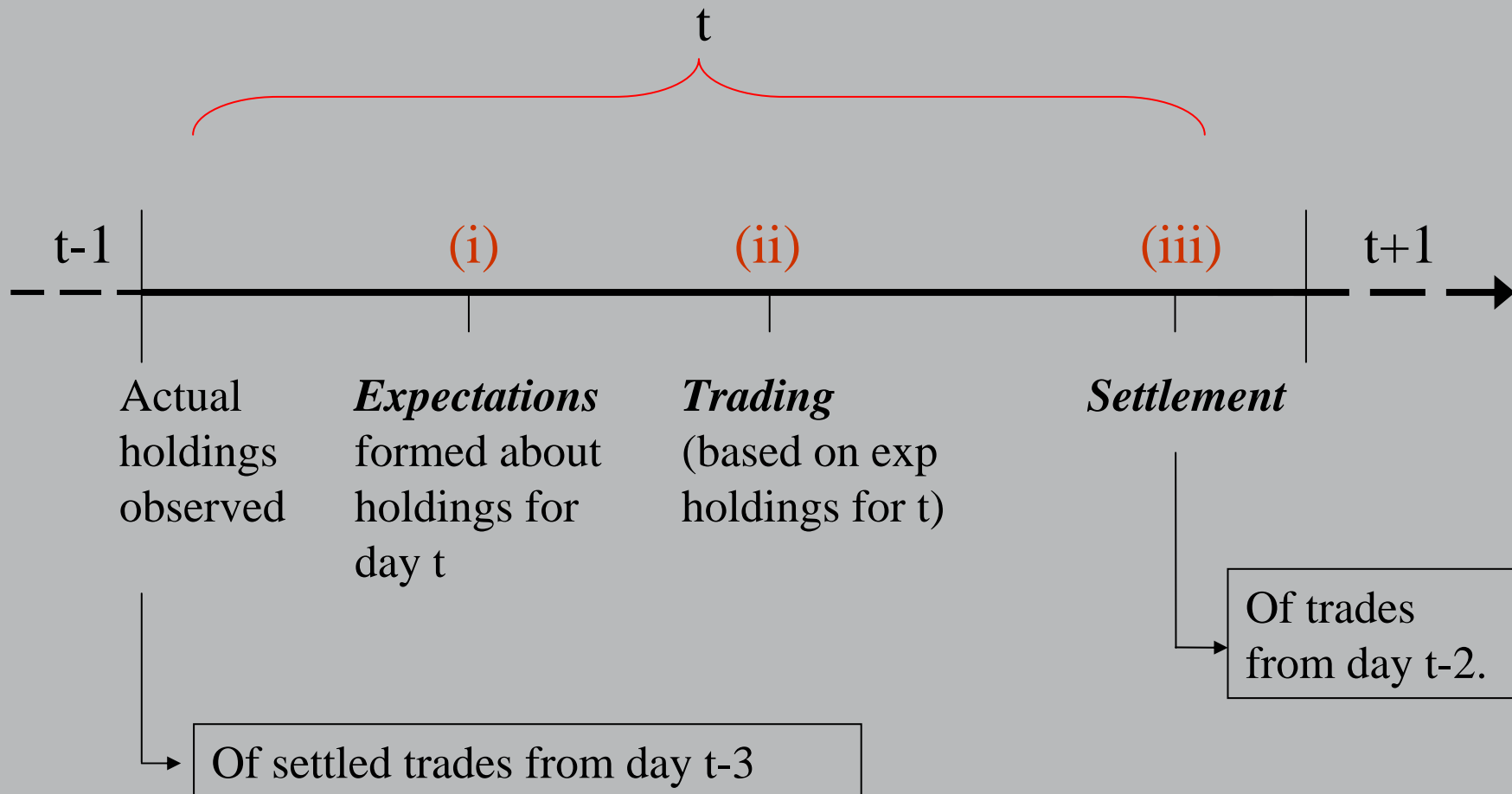
Model

- ❑ N participants; K securities; Gross settlement; Two-day settlement lag

- ❑ Quantity and price of each security normalised to 1.

- ❑ Initial allocations: two possible schemes
 - "*Diversified*": Each participant receives $1/N$ of each security
 - "*Concentrated*": Entire qnty of each security allocated randomly to a participant
 - For each scheme: Cash = 5% of total assets

Model: Timing of events on day t



Expected asset holdings

- ❑ "*Normal periods*": Participants assume that all previous trades will settle
 - No settlement failures occur
- ❑ "*Crisis periods*": Participants reduce expected holdings for day t by a multiple of % unsettled trades from $t-1$

Trading

- ❑ Choose two counterparties and a security
- ❑ Use **expected** holdings of cash and securities to determine set of feasible trades
- ❑ Random draw of a trade from feasible set
- ❑ Update expected holdings after each trade

Settlement

- ❑ Two-day lag: day $t-2$ trades settled at end of day t
- ❑ Uses **actual** asset holdings from day $t-2$
- ❑ Credit available during settlement
 - credit line % asset size
 - different credit limits in different scenarios
- ❑ Unsettled trades put in a queue

Shock

- ❑ Largest participant fails at end of day D
 - CPSS recommendation
 - Practice in real stress tests
- ❑ Unsettled trades with defaulter deleted
- ❑ Anticipated by other participants
 - Stop trading with defaulting participant
- ❑ Participants adjust expected asset holdings
 - (1) Delete unsettled trades with defaulter (direct effect)
 - (2) Reduce expected holdings for indirect effects

Settlement efficiency

❑ Total settlement efficiency

$$\frac{\text{Value of settled trades}}{\text{Value of total trades}}$$

❑ Indirect settlement efficiency

$$\frac{\text{Value of settled trades}}{\text{Value of trades excluding defaulter}}$$

Simulation results: First day impact

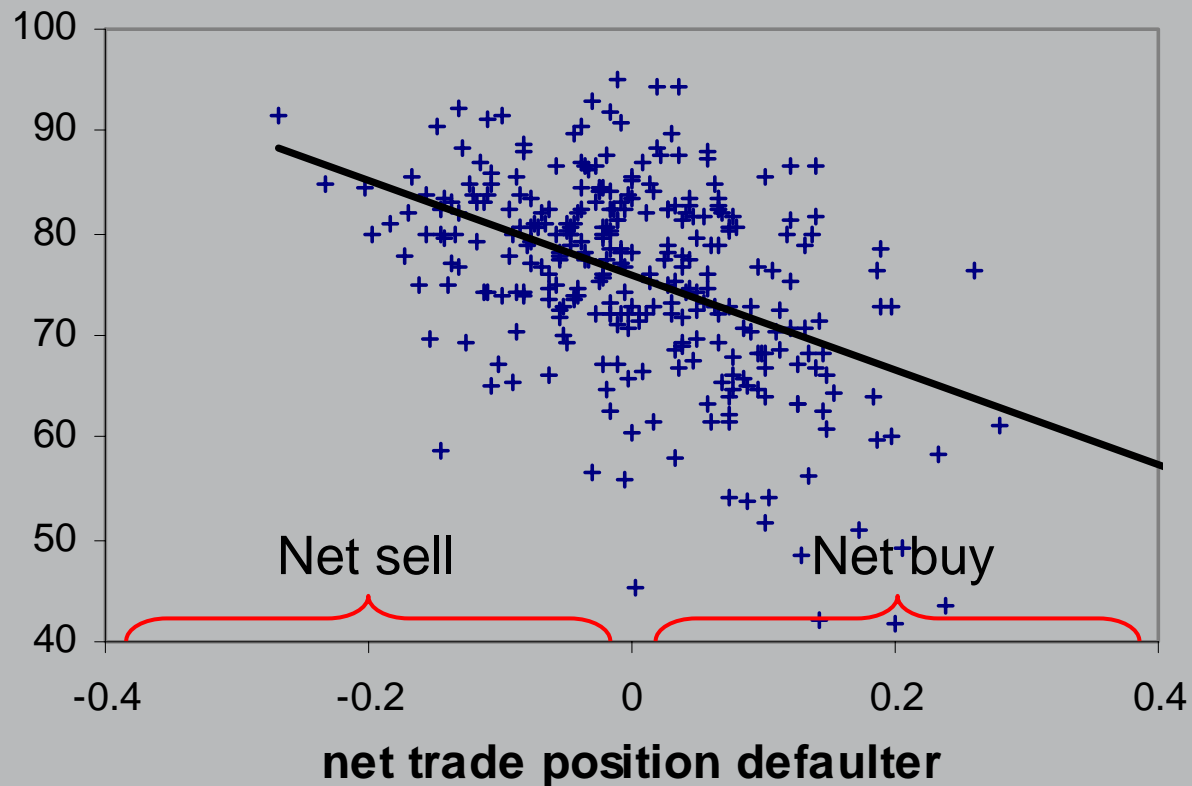
Settlement efficiency on day D

Credit limit (%assets)	initial allocation	Total settlement efficiency	Indirect settlement efficiency
0	concentrated	57.84	75.69
	diversified	70.2	80.95
50%	concentrated	72.27	94.89
	diversified	83.95	96.99
100%	concentrated	72.19	94.926
	diversified	83.99	96.97

Results reported for K=30, N=15

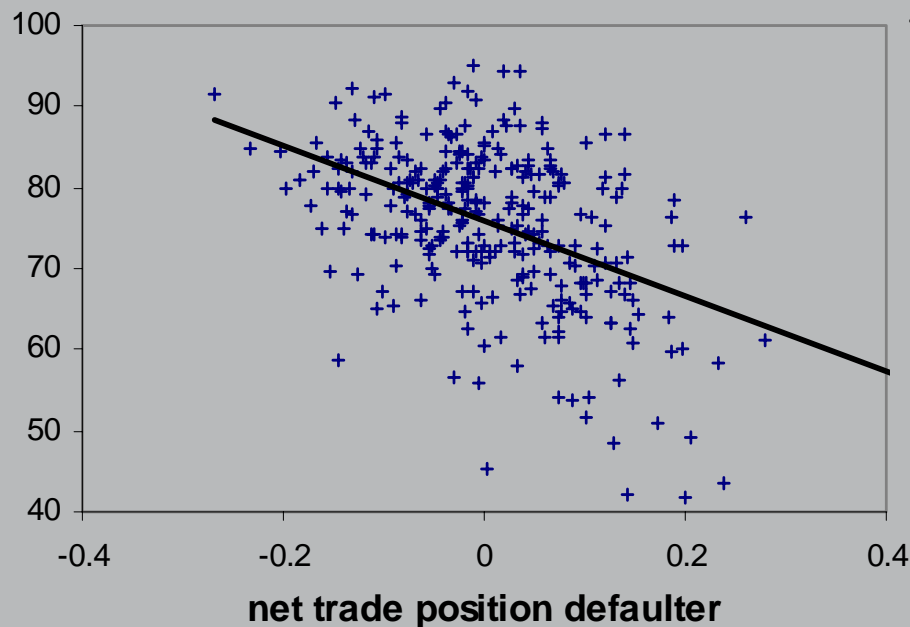
Trade position of defaulter

indirect settlement efficiency
(no credit)

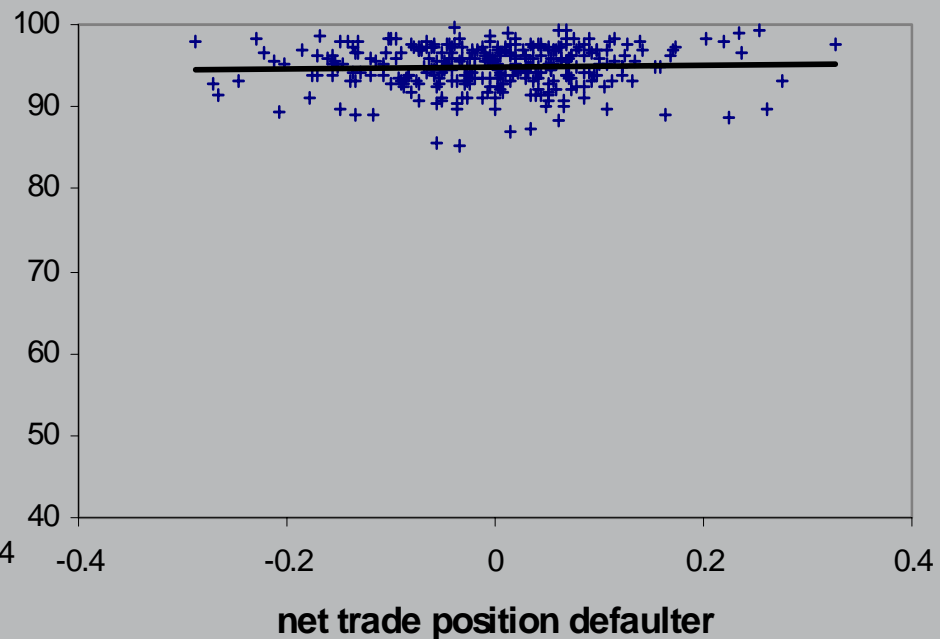


Trade position of defaulter

indirect settlement efficiency
(no credit)

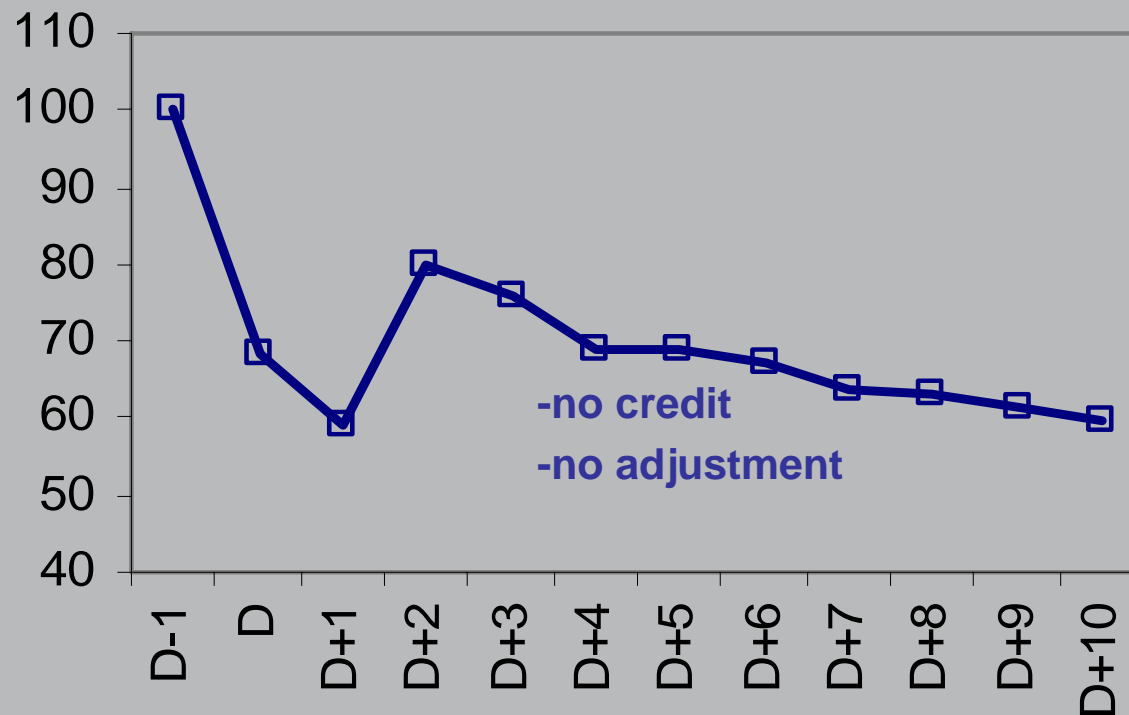


indirect settlement efficiency
(credit limit=1)



Length of a crisis

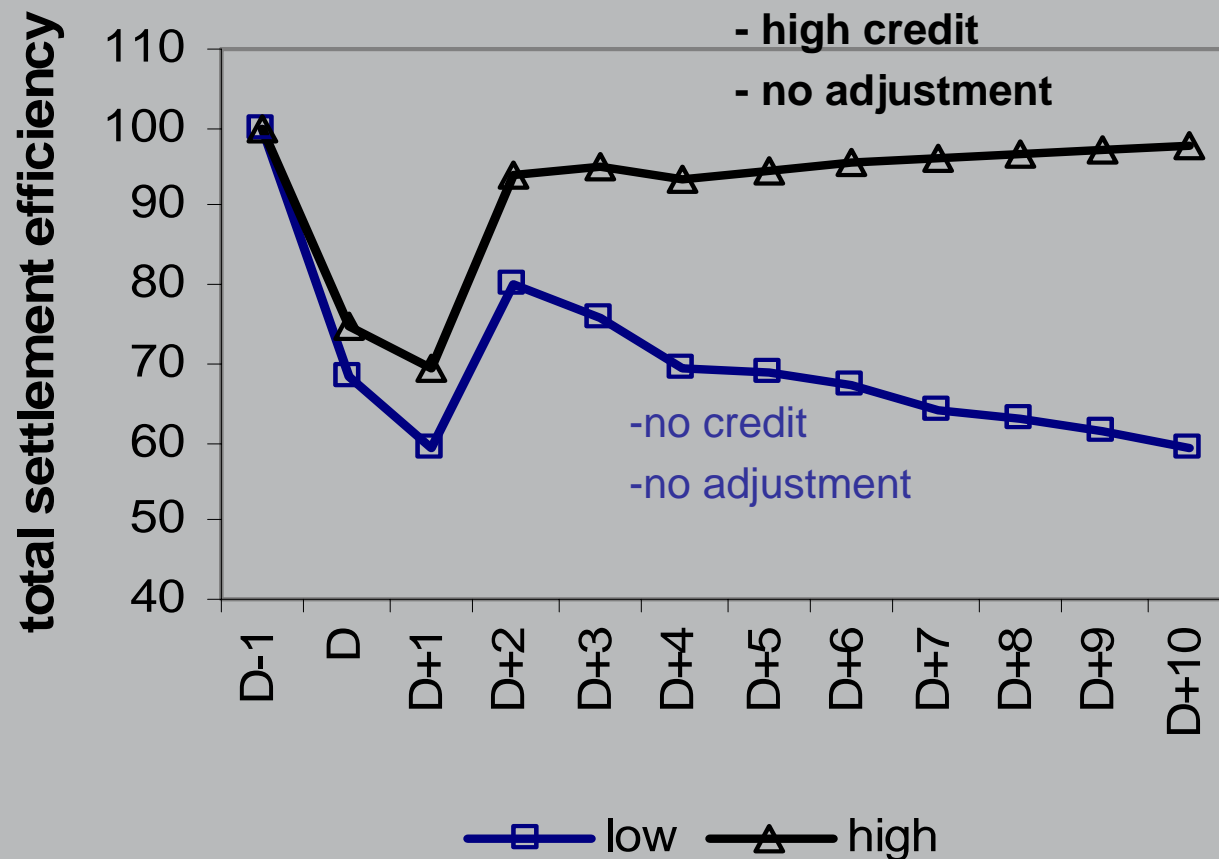
total settlement efficiency



—□— low

- Multiple day crisis
- Largest impact on D+1
- Continuing contagion

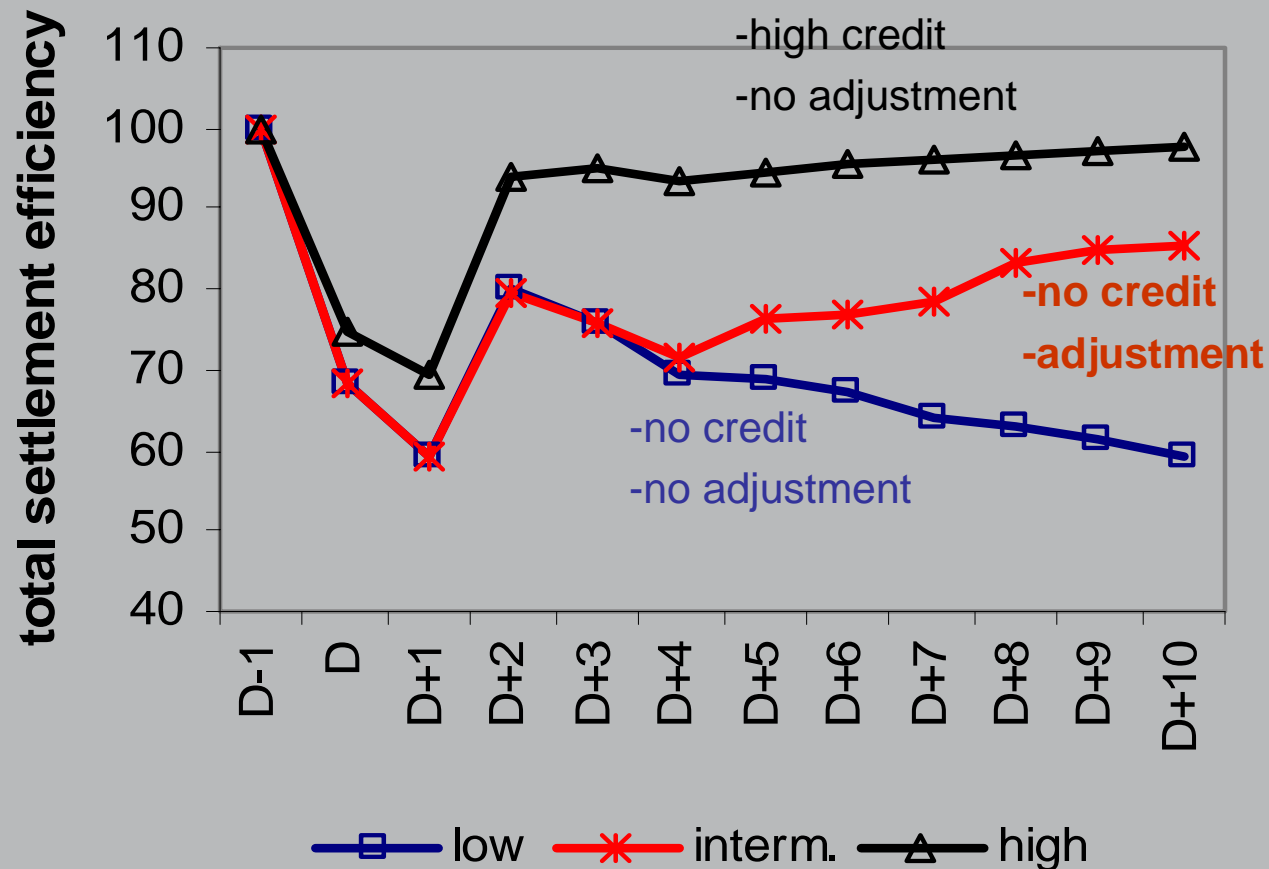
Length of a crisis



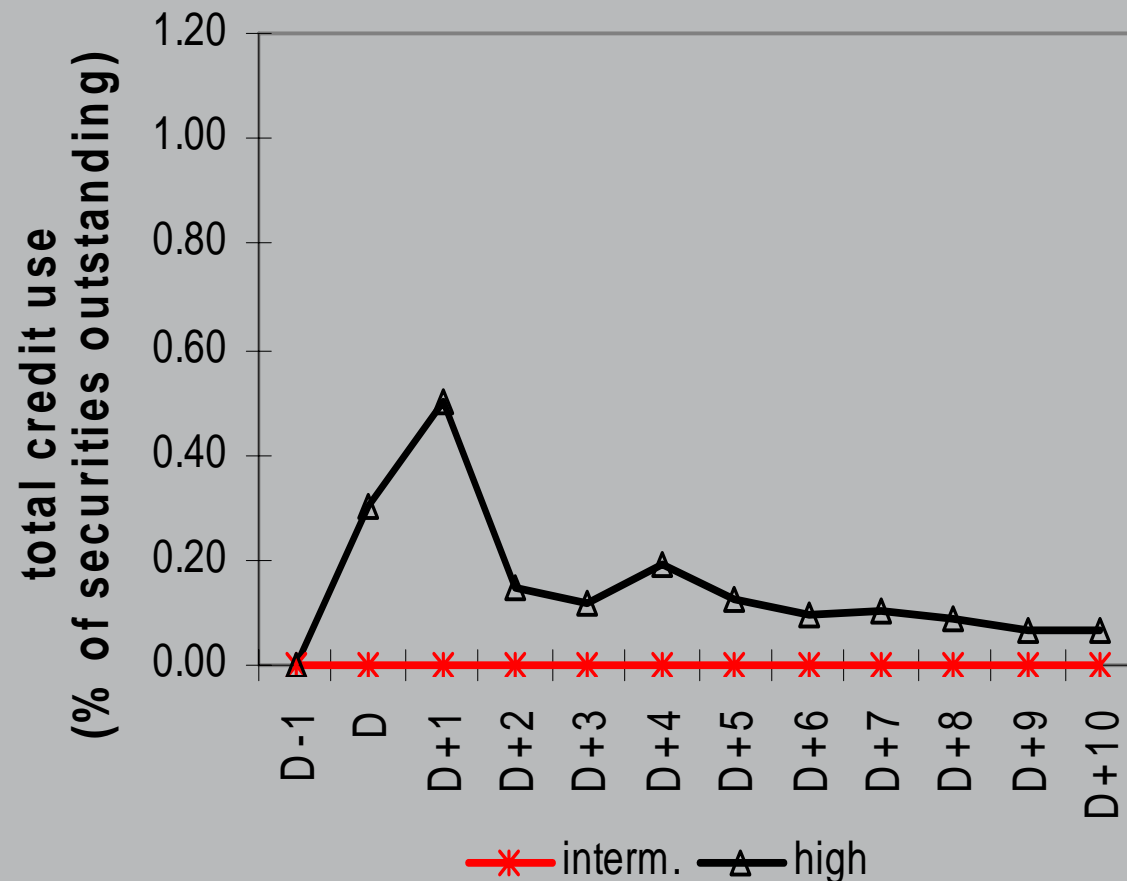
- Liquidity important
- ... but does not eliminate settlement failures

Length of a crisis

- Liquidity and expectations: partial substitutes



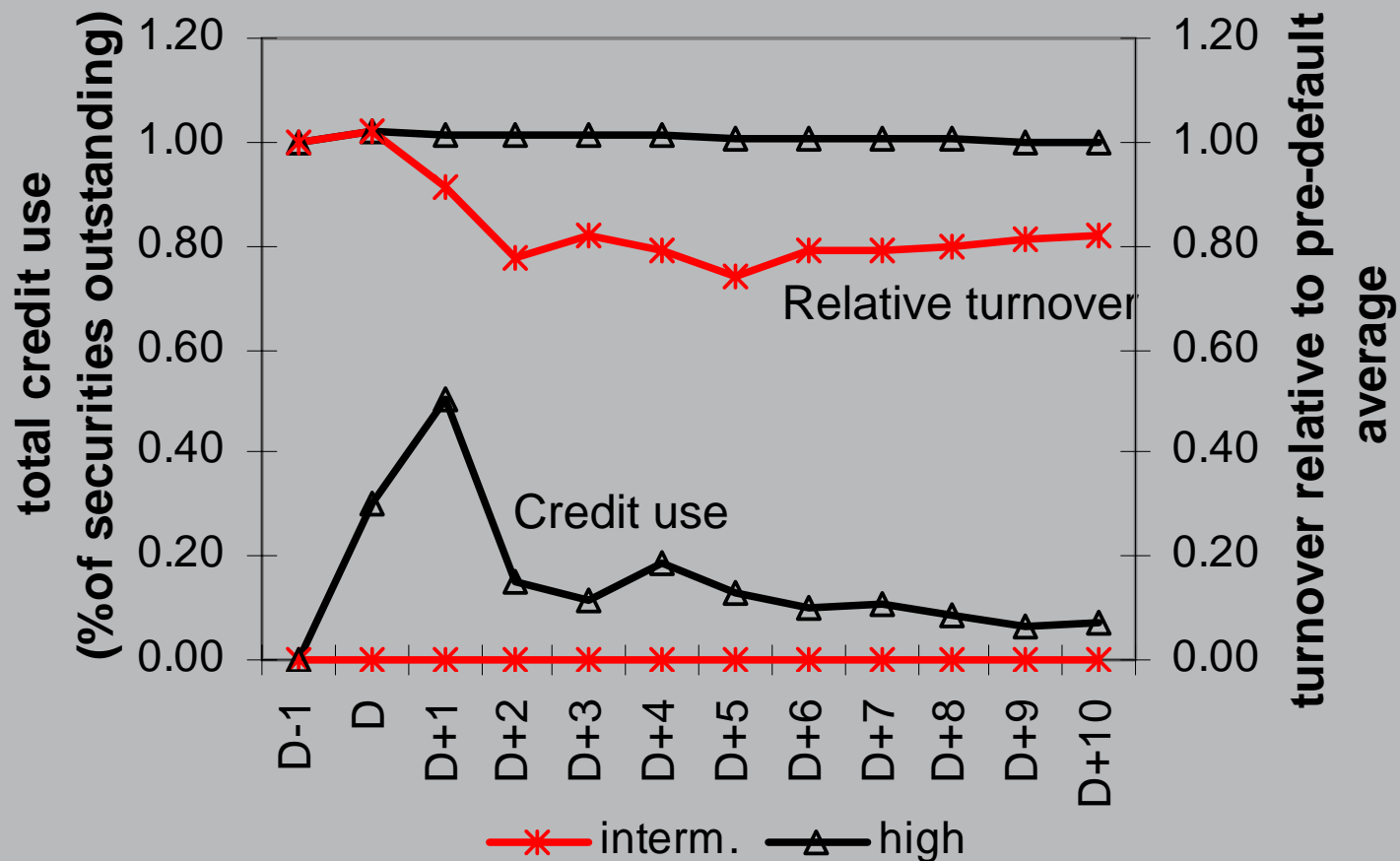
Credit use



- Peak usage on D+1
- > 50% assets
- Well above 10% assets for longer period

Trading volume

□ Adjustment of trades = turnover ↓



Conclusions

- ❑ Even with DVP, large settlement failures possible
- ❑ Disruptions last longer than a day
 - Crisis worsens before improving
 - Disruption may last longer than the length of the settlement lag
 - Policy makers should not focus only on first-day impact
- ❑ Liquidity can lower settlement failures
 - Providing enough liquidity may be costly
 - Liquidity cannot eliminate settlement failures
- ❑ Liquidity and participants' reduction of trades partial substitutes
 - Reduction of trade volume may cause market liquidity to ↓

Conclusions

- ❑ Other options for lowering settlement failures
 - Shortening settlement lag
 - Securities borrowing and lending program

- ❑ Improving existing stress tests
 - Multiple days
 - Dynamic (include reactions of participants)
 - System wide perspective
 - Settlement efficiency + turnover