

A liquidity 'black hole' in a large value payment system: What is the impact of a failing participant on its environment and does time matter?

Work in progress

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Outline

- 1 Introduction
- 2 Research question
- 3 Method and preliminary results
- 4 Concluding remarks



Sagittarius A* vs failing LVPS participant

Sagittarius A*

- All mass falling in disappears forever.
- Time is not properly defined.
- Becomes heavier at the cost of other objects in its surroundings.



Failing LVPS participant

- All liquidity sent to stays there.
- Length of failure not relevant for its own liquidity position
- Gains liquidity at the cost of other participant in its network.



- technical
- software (e.g. update)
- power outage
- cyber attack
- human
- ...

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- This paper aims to:
 - 1 identify the Minimum Payment Time Interval (MPTI) a single participant does not send in any payment instruction to be considered an outage and
 - 2 ... measure the impact of such an outage over time, starting at this MPTI.

Relevant literature 1/2

Operational outages:

- Klee (2010):
 - ▶ detection outages in Fedwire (15 minutes cut off)
- Glowka, Paulick and Schultze (2018):
 - ▶ defining outages of longer than 30 minutes with no or low activity for TARGET2 (according to SLA reporting time).
- Arjani and Heijmans:
 - ▶ Similar to Glowka et al (2018), but for Canadian LVTS including validation of method.

Relevant literature 2/2

Measuring impact:

- Heijmans and Wendt (2019): failure in terms of liquidity and network impact for banks and FMIs in TARGET2 at daily basis.
- Berndsen and Heijmans (2019): FMI/LVPS level at daily basis.

Timing and free riding:

- Bech and Garratt (2003, 2006) game theoretical model on intentional delay.
- Diehl (2013) free riding in TARGET2-BBK.

What do we add to the literature?

- Define participant specific outage time interval (MPTI) instead of fixed cut off (e.g 15 or 30 minutes).
- Measuring the impact over time (instead of fixed time interval, e.g. day).
- Relate liquidity impact to e.g. reserve requirements of the counterparties of failing bank.
- Intraday picture (per hour): keeping track of difference in payment activity (e.g. lunch dips).

Data

- TARGET2-NL (as starting point)
- TARGET2 (To extend analysis and include more large banks)



Which variables from transaction data?

- Introduction date (not settlement)
- Introduction time (during opening hours in microseconds)
- Sender (bic8)
- Receiver (bic8)
- Payment value (EUR)
- Payment type (Eurosystem statistical code)

Payment type selection:

- MPTI: all except transactions with ancillary systems
 - ▶ Settlement organisations and SSS, often direct debits)
- measuring impact to other banks: interbank payments (1.1 and 1.2) only
 - ▶ ignore impact to central banks

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Results split up:

- 1 look at finding the minimum payment time interval (MPTI)
- 2 look at measuring the impact (work in progress)

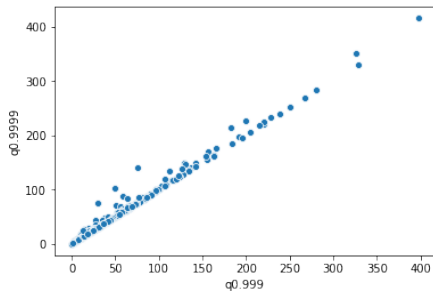
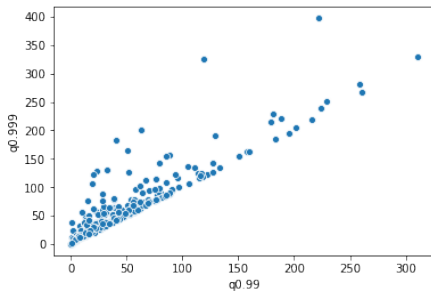


Figure: Distribution of outage times per hour per bank size

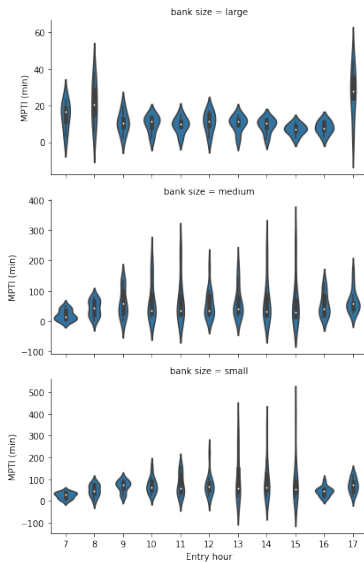


Figure: Distribution of outage times per hour per bank size

Concluding remarks MPTI

- 99.99 percentile as MPTI cut off
 - ▶ Large banks: MPTI 13 minutes
 - ▶ Small banks: MPTI 59 minutes
- For large banks: during first hour and last hour longer MPTIs
 - ▶ first hour: payments send in before opening hours (introduction vs settlement time)
 - ▶ last hour: lower general activity

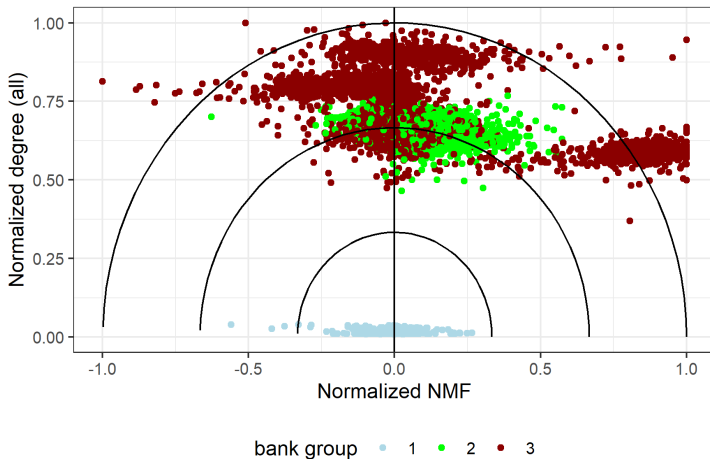


Figure: Indicator using the net multilateral flows (2017-2018).

Source: Heijmans and Wendt (2019)

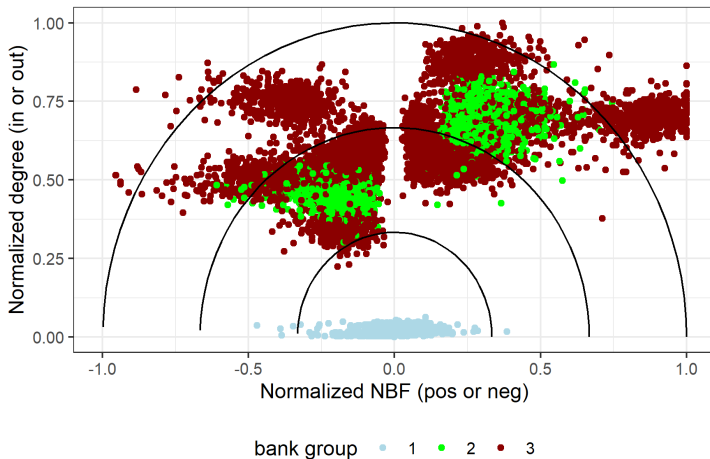


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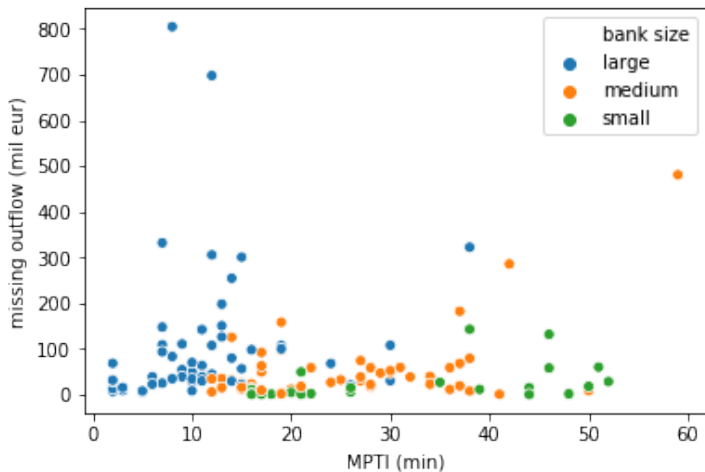


Figure: Missing liquidity outflow at MPTI for each bank per hour.

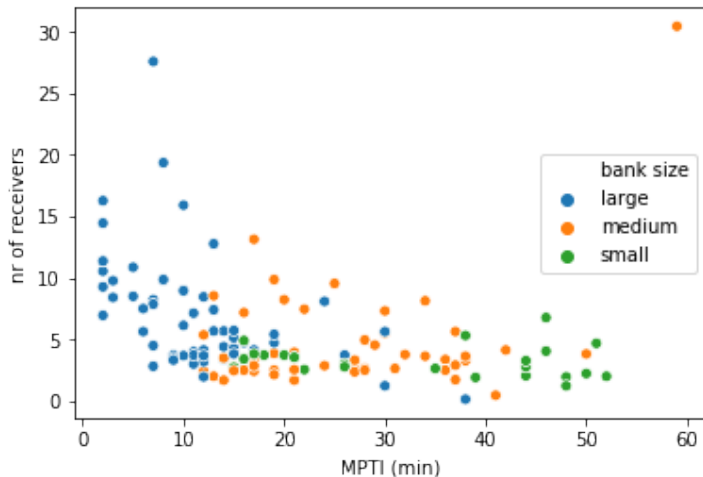


Figure: Average number of affected receivers at MPTI per bank per hour.

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Preliminary conclusions

- We define a bank specific minimum time for a potential outage.
- This minimum time varies between different:
 - ▶ failing participants (e.g. 13 or 59 minutes).
 - ▶ different hours of the day.
- Impact not evenly distributed over counterparties.

Who can use the tool we develop?



- Payment system operators (in monitoring liquidity and systemic impact, PFMI).
- Financial stability experts (measuring systemic impact of large participants).



Still to do

- Extend analysis to full TARGET2 data (including more large banks).
- Measure impact relative to e.g. reserve requirements.

