Banks' Intraday Liquidity Management during Operational Outages: Theory and Evidence from the UK

Ouarda Merrouche and Jochen Schanz, Bank of England

Joint BdF / ECB conference on

"Liquidity in interdependent transfer systems“, Paris, 9-10 June 2008

Overview

1. Background and policy questions
2. Theory: Setup and predictions
3. Empirics: Specifications and results
4. Summary

Overview

1. **Background and policy questions**
2. Theory: Setup and predictions
3. Empirics: Specifications and results
4. Summary

Background and policy questions

- Settlement banks in CHAPS occasionally experience operational problems (inability to send).
- Risk: **Liquidity sink**.
  - Other settlement banks continue to pay to the stricken banks
  - Liquidity is absorbed
  - Payments between healthy banks are postponed → settlement risk increases.
- Investigate how banks to operational shock at one of their counterparties
  - Reaction of payments to stricken bank
  - Reaction of payments between healthy banks

Overview

1. Background and policy questions
2. **Theory: Setup and predictions**
3. Empirics: Specifications and results
4. Summary

Setup

- Two banks, four periods, opportunity costs of posting collateral.
- Each bank has one ‘normal’ and, possibly, one ‘urgent’ transaction to execute. Positive delay costs for urgent transaction only. Positive cost of failing to execute any instruction.
    1. Each bank decides how much collateral to post
    2. Morning: may execute normal payment instruction
    3. Afternoon: may receive an urgent payment instruction, and may execute all remaining instructions
    4. Evening: may attempt to raise additional liquidity, and execute all remaining instructions.
- Banks can be hit by publicly observable operational shock.

Predictions

Prediction: For sufficiently high delay costs of urgent transaction, and sufficiently high opportunity costs of collateral:

- Healthy bank delays payments to stricken bank in the morning (when uncertain about payment instructions),
- not in the afternoon.

Intuition:

- By making payments behaviour contingent on opponent's operational availability in morning, can ensure that sufficient liquidity is available for urgent payment
- In afternoon, no incentive to delay any payments (subject to sufficient liquidity):
  - Cost of posting collateral is sunk
  - Risk of own operational outage in evening

Overview

1. Background and policy questions
2. Theory: Setup and predictions
3. **Empirics: Specifications and results**
4. Summary

Outage Days

Outages	Date	Start time	End time	Start time in seconds	End time in seconds	Duration	Control Days
1	March 19th	07:00	08:10	25200	29400	1:10	March 16th
2	April 27th	15:05	15:50	54300	57000	0:45	April 26th
3	May 29th	12:33	12:51	45180	46260	0:18	May 25th
4	June 1st	12:24	13:17	44640	47820	0:53	May 31th
5	June 11th	06:00	07:40	21600	27600	1:40	June 8th
6	September 3rd	06:05	08:30	21900	30600	2:25	August 31st
7	September 4th	13:14	13:30	47640	48600	0:16	August 31th
8	October 8th	06:59	07:35	25140	27300	0:36	Octobr 5th

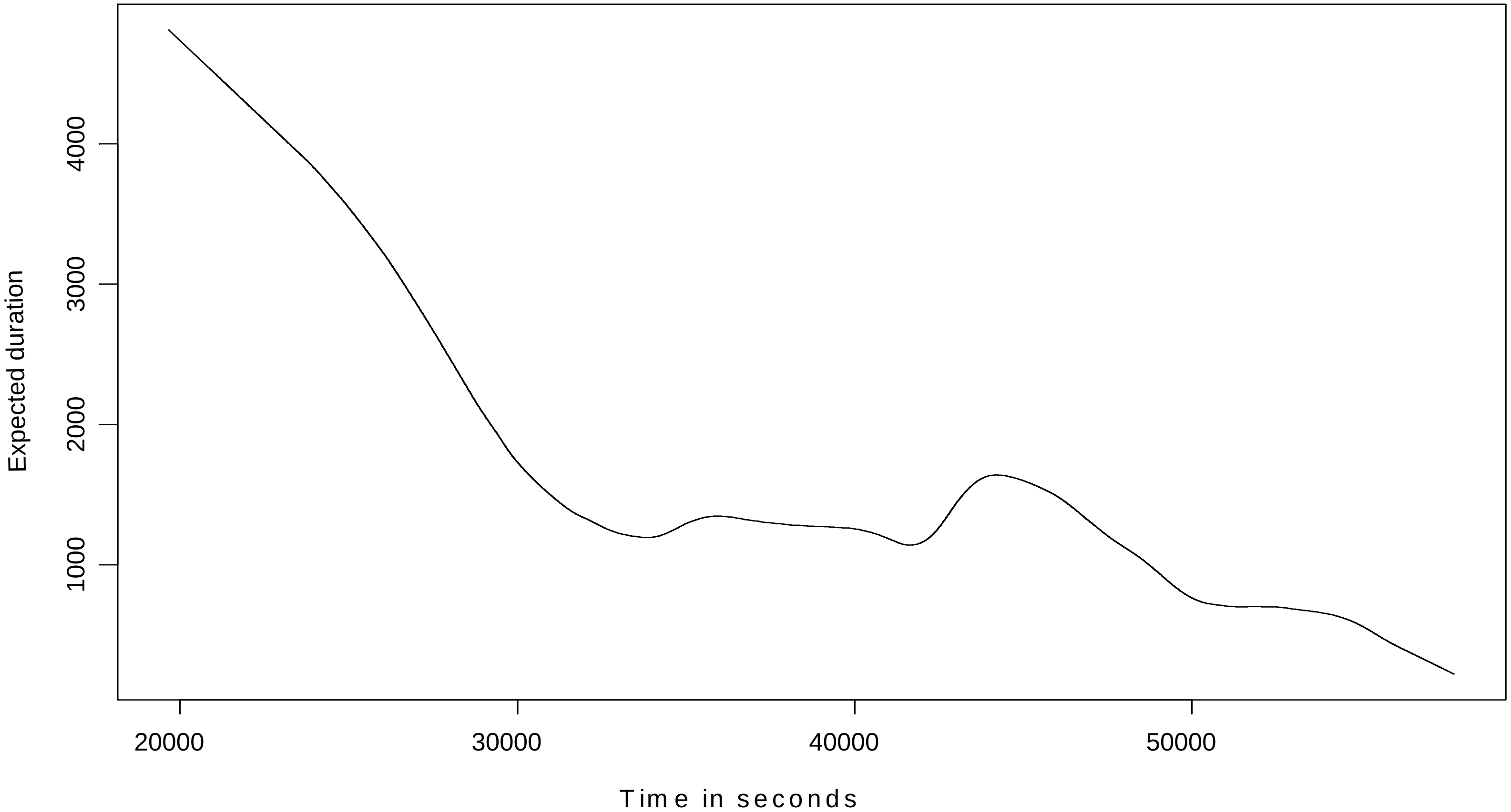
Table 1: Outages in 2007

Payments Data

- More than 450.000 observations transaction-by-transaction data
- Irregularly time spaced data
- Common to aggregate data within arbitrary fixed intervals: loss of information, need make a choice as to what is the optimal time interval?
- Here, follow Engel and Russell (1998), focus on reciprocal of the frequency: duration between transaction
- Durations are value-weighted (Gourieroux et al (1999): Time to observe 1 billion £ transferred through chaps

Intraday Profile

•



Specification

$$I_i^b = c + Outage_{bd} * before + Outage_{bd} * during + Outage_{bd} * after + f_1(t_i) + \gamma_b$$

$$I_i^b = c + f_2(N_{id}) + f_3(t_i) + \gamma_b$$

$$I_i^b = c + Outage_{bd} * before + OdMorning_i + OdAfternoon_i + Outage_{bd} * after + f_4(t_i) + \gamma_b$$

Results (1)

Dependent variable: incoming duration	*(1)*
Before outage	**0.058** (0.004)
During outage	**0.596** (0.008)
After outage	**-0.08** (0.003)
Time and bank fixed effects	x
Observations	**149,811**
R-squared	**0.48**

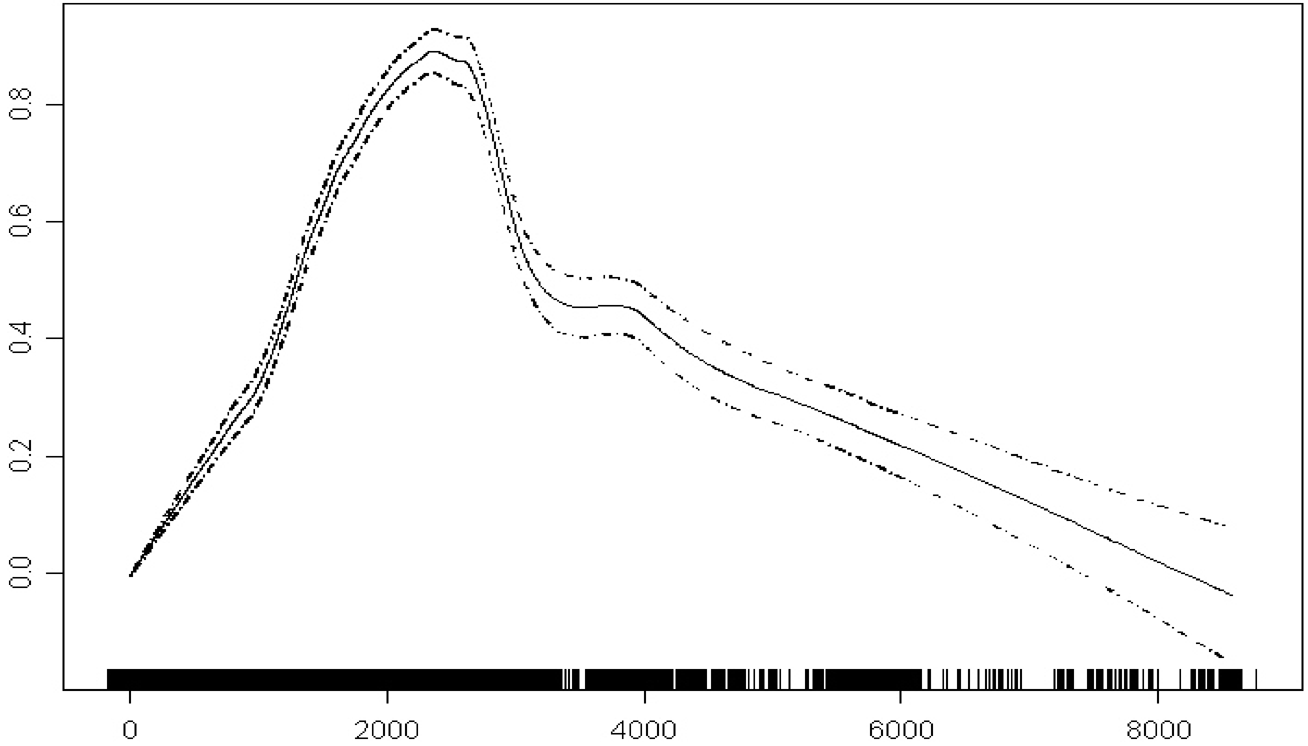
Results (2): Morning versus Afternoon

Dependent variable: incoming duration	*(2) Morning versus Afternoon*	*(3) No extreme outages*	*(4) Pre August 9th*
Before outage	**0.068** (0.004)	**0.076** (0.004)	**0.071** (0.004)
After outage	**-0.089** (0.003)	**-0.12** (0.004)	**-0.115** (0.004)
During morning outage	**1.516** (0.015)	**0.476** (0.02)	**1.242** (0.018)
During afternoon outage	**0.206** (0.01)	**0.206** (0.01)	**0.163** (0.011)

Results (3): Crisis vs non-crisis

Dependent variable: incoming duration	*(5)*	*(6)* *Post August 9th*
Before outage	**0.025** (0.004)	**0.065** (0.008)
After outage	**-0.07** (0.006)	**-0.055** (0.005)
During morning outage		**2.177** (0.025)
During afternoon outage		**0.45** (0.034)
During crisis outage	**0.516** (0.028)	
During non-crisis outage	**-0.025** (0.012)	

Results (4): Intra-Outage Dynamics



Results (5): Externalities

Dependent variable: incoming duration	*(7)*
Before outage	**-0.161** (0.124)
During outage	**0.057** (0.124)
After outage	**-0.074** (0.124)

Overview

1. Background and policy questions
2. Theory: Setup and predictions
3. Empirics: Specifications and results
4. **Summary**

Summary

1. Settlement banks restrict their payments to banks that experience operational outages.
2. This reaction is stronger in the morning (when uncertainty about instructions is high) than in the afternoon.
3. Reaction is stronger in times of market stress (2007 H2).
4. No externalities: Payment behaviour of healthy banks to each other unaffected.