Central Bank Intervention in Large Value Payment Systems: An experimental approach

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Outline

Motivation

- Problems in large value payment systems may spill over to other parts of the financial system => systemic risk.
- Disruptions affect the behavior of participants (liq. crisis).
- Central banks provided astronomical amounts into the financial system through LVPSs.

Why an experiment?

- Disruptions are typically tail events, real life data are limited.
- Computer simulations offer the opportunity to study stress situations, but assumptions about behavior under extreme circumstances must be made.
- An experiment generates such behavior endogenously under controlled conditions.
- However, an experiment is not a substitute for simulations but should be seen as a complement.
- This is the second experimental study on large value payment systems (first: Abbink et al 2010.)

Obvious criticisms

- An experiment is not a real situation.
- How can students (subjects) reflect real actors in the economy?

Research question

- How can behaviour (in a disrupted) LVPS, be influenced by an authority (central bank)?

Model used?

- Based on theoretical work by Bech & Garratt (2006).
- Simple model:
  - n banks have to pay one unit to each other
  - two periods: morning and afternoon
  - either pay in the morning or delay to the afternoon
- Delaying a payment involves a cost D
- Paying in the morning involves a cost F which depend on how many other banks delay their payment
- We follow the setup of the experiment executed by Abbink et al 2010.

Experimental model with n=5 banks

- Payoff $player_i$ ($bank_i$) choosing option Y (paying in the afternoon) = 2.
- Payoff $player_i$ choosing option X (paying in the morning) = depends on number of players choose Y
- Simple model:

Number of other players choosing Y	Your earnings from choosing X	Your earnings from choosing Y
0	5	2
1	3	2
2	1	2
3	-1	2
4	-3	1, 2, 3

- If 0 or 1 players choose Y then the best response is to choose X => efficient equilibrium
- If two or more players choose Y, then the best response is to choose Y as well => inefficient equilibrium

Experimental treatments

1. Baseline (15 groups)
2. Bail out (14)
3. Punishment (17)
4. Information (15)

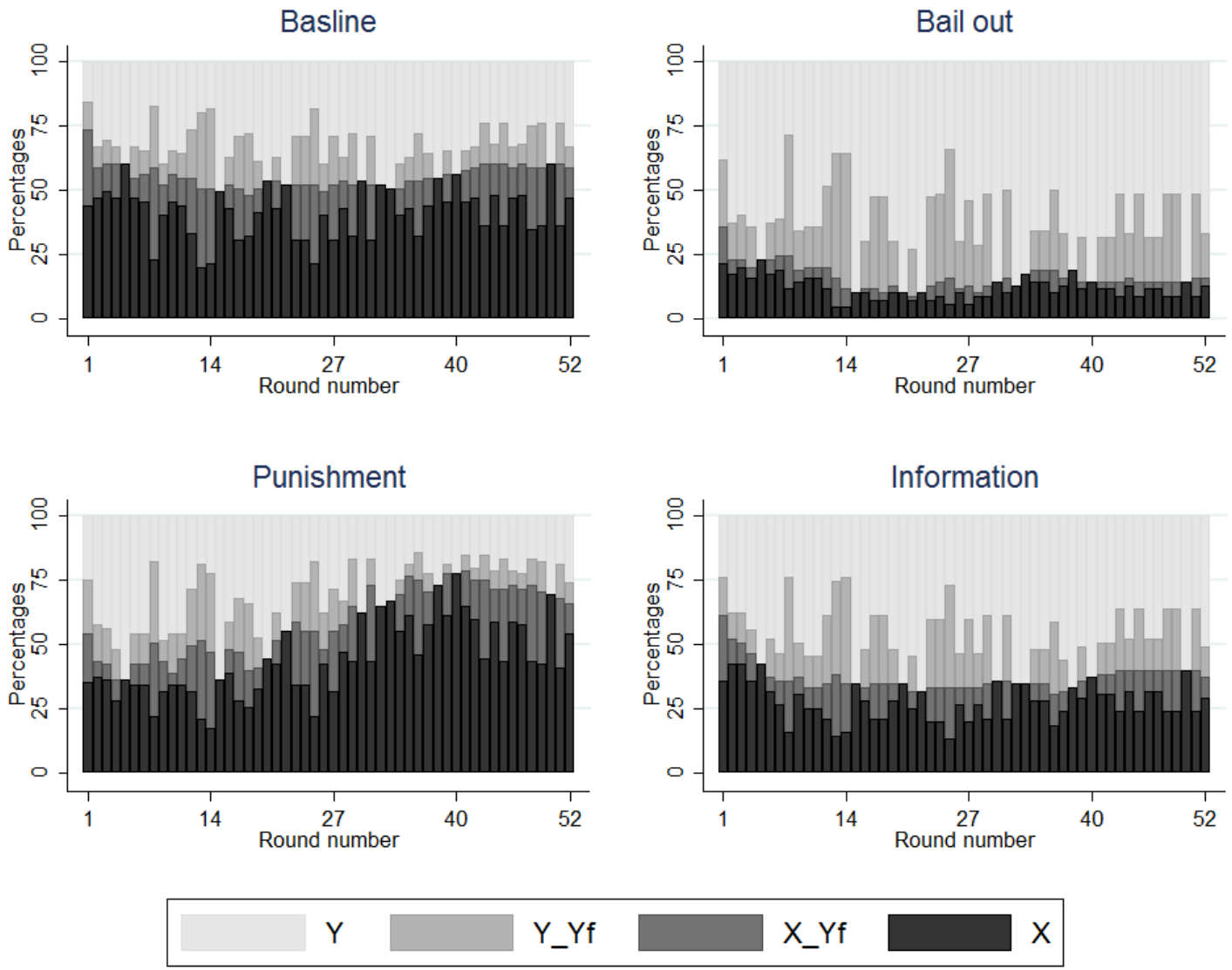

Figure : Frequency plot of X, Y, Y_{yf}, X_{yf}

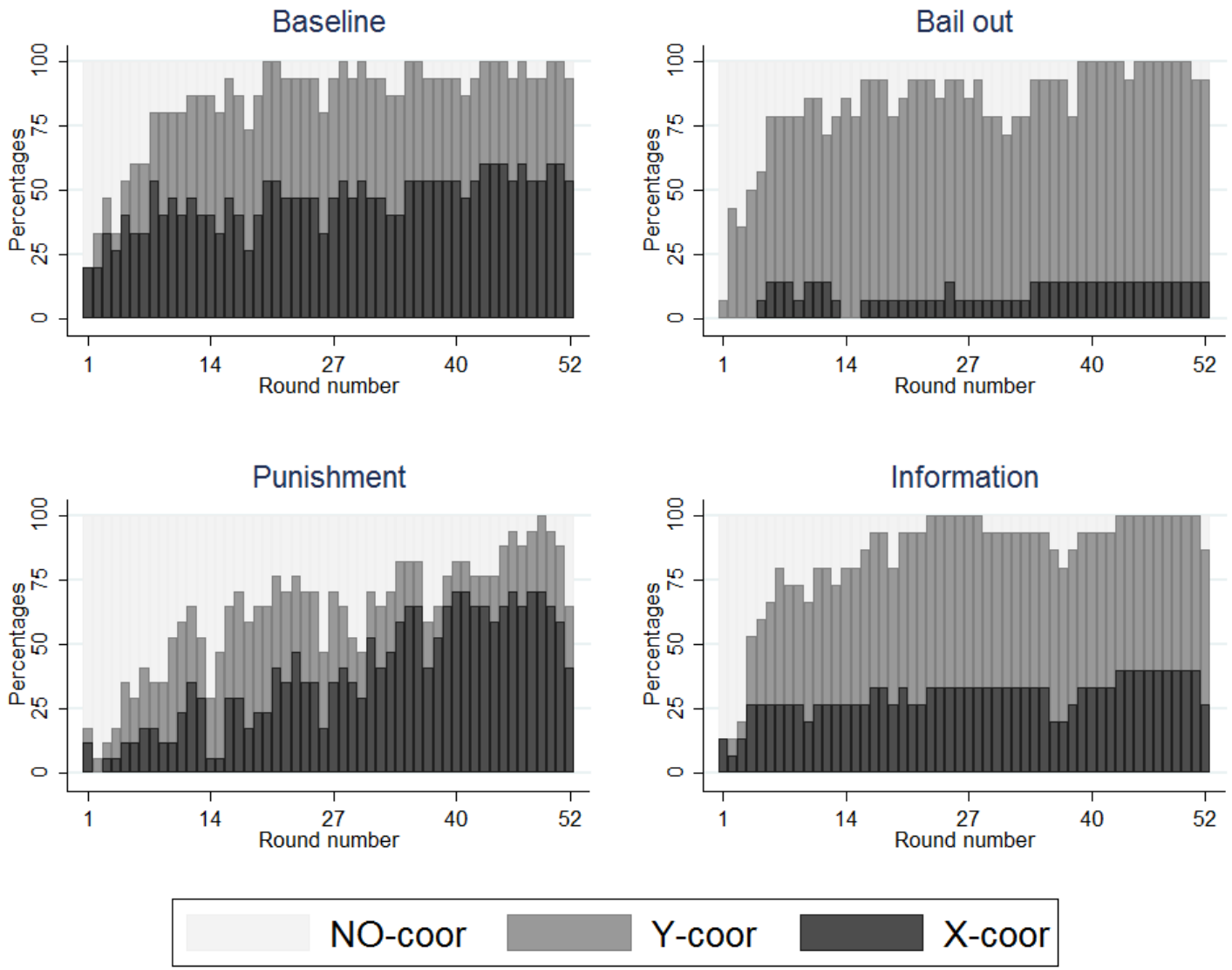

Figure : coordination on X and Y based on real choices (no Y_f).

Compared to Baseline

- Bail Out has significantly less coordination on X (as expected)
- Punishment has less coordination on X in first half and more in second half of experiment.
- Information has less coordination over all.

Dynamics

- Imitation (only one discussed in presentation)
- Myopic best response
- Choose X when profitable
- still in progress ...

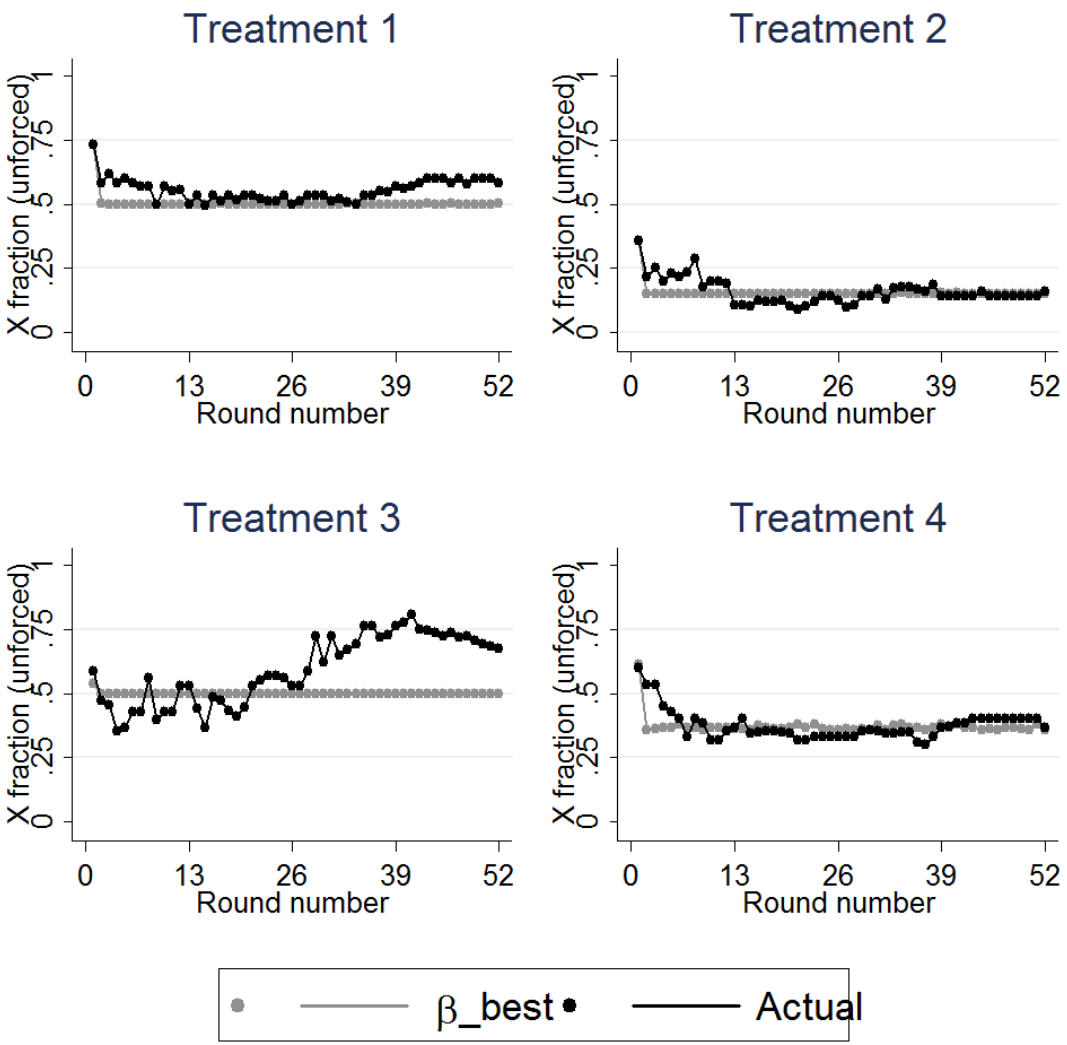

Figure : Heuristics: fraction imitation.

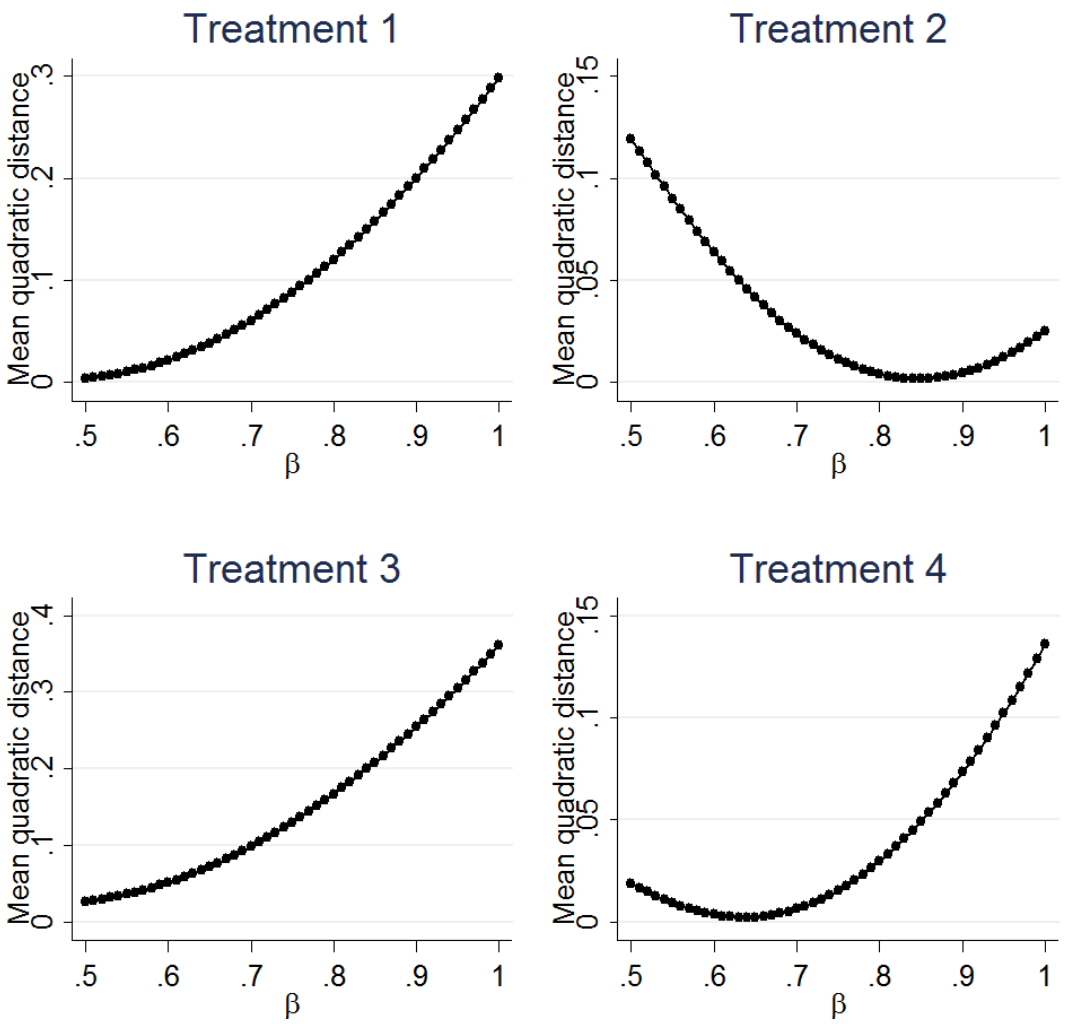

Figure : Heuristics: sum of squares imitation.

Imitation heuristics

- Heuristic follows data for treatment 1, 2 and 4.
- Not for treatment 3
- Especially in second half of the experiment.

- The “bail out” and “punishment” treatments give the expected results:
  - bail out: participants tend to coordinate significantly MORE on Y
  - Punishment: participants tend to coordinate significantly LESS on Y
- Providing information on disruptions gives more coordination on Y (while more coordination on X was expected).
- Simple dynamic models do not reflect the real outcome of the experiment very well. We still investigate the opportunities here (in progress).
- Perhaps different models required for the 4 different treatments: However, good reasoning should be found to do this.