Intraday Settlement Activities in the BOJ-NET RTGS

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Kei Imakubo & Yutaka Soejima

Bank of Japan

The views expressed in this presentation do not necessarily reflect those of the Bank of Japan.

Objectives

- To identify the negative effect of "stress" on the BOJ-NET RTGS given features in Japan's payment market

- To analyse the intraday RTGS activities using both static network and dynamic simulation analyses
  - Network analysis quantifies the relationship among banks in terms of degree, cluster, etc.
  - Simulation analysis predicts and quantifies possible changes in intraday activities under the stress situation.

Outline

1. Basic Information
2. Some Features
3. Static Network Analysis
4. Dynamic Simulation Analysis
5. Conclusion

Overview (1)

- ● BOJ-NET RTGS system started in Jan. 2001.
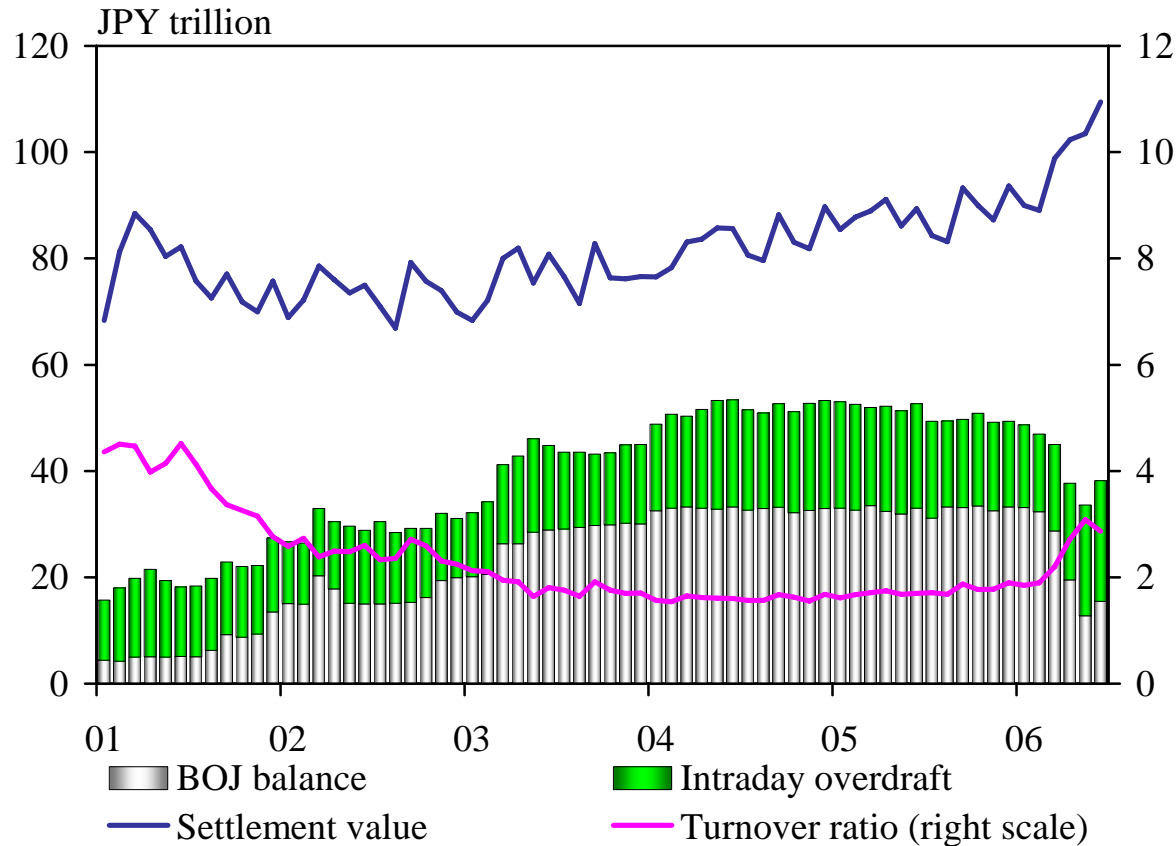
Note: Data are daily averages.

Overview (2)

- Value of payments has moderately increased with increased repo transactions.

- BOJ balances gradually increased along with rises in the targeting range of BOJ balances under the quantitative monetary easing policy.

- Intraday O/D was effectively used with ample collateral and the SPDC (Simultaneous Processing of DVP and Collateralisation) facility.

- The operating target was switched back from the amount of BOJ balances to the uncollateralized O/N call rate in Mar. 2006. The targeting range of the O/N rate was raised from zero to 0.25% in Jul. 2006.

Strategic Settlement Behaviour in RTGS

- Outgoing payments consist of "independent payments" and "reactive payments."
  - Independent payments that a bank wishes to settle independently of incoming payments.
  - Reactive payments that a bank wishes to settle in response to incoming payments.
- In general, independent payments can increase the likelihood of that banks make reactive payments.
  - The larger the amount of independent payment is made at the appropriate timing, the more smoothly overall payments proceed.

See McAndrews & Potter [2002].

Intraday RTGS Activities

- The chart shows the intraday RTGS activities.
  - Average daily value of interbank funds transfers was JPY 39 trillion in Dec. 2005.
  - 50% of them was settled in 9:00-10:00; 64% in the morning; and 36% in the afternoon.

JPY trillion

Average+/-2S.D.   Average

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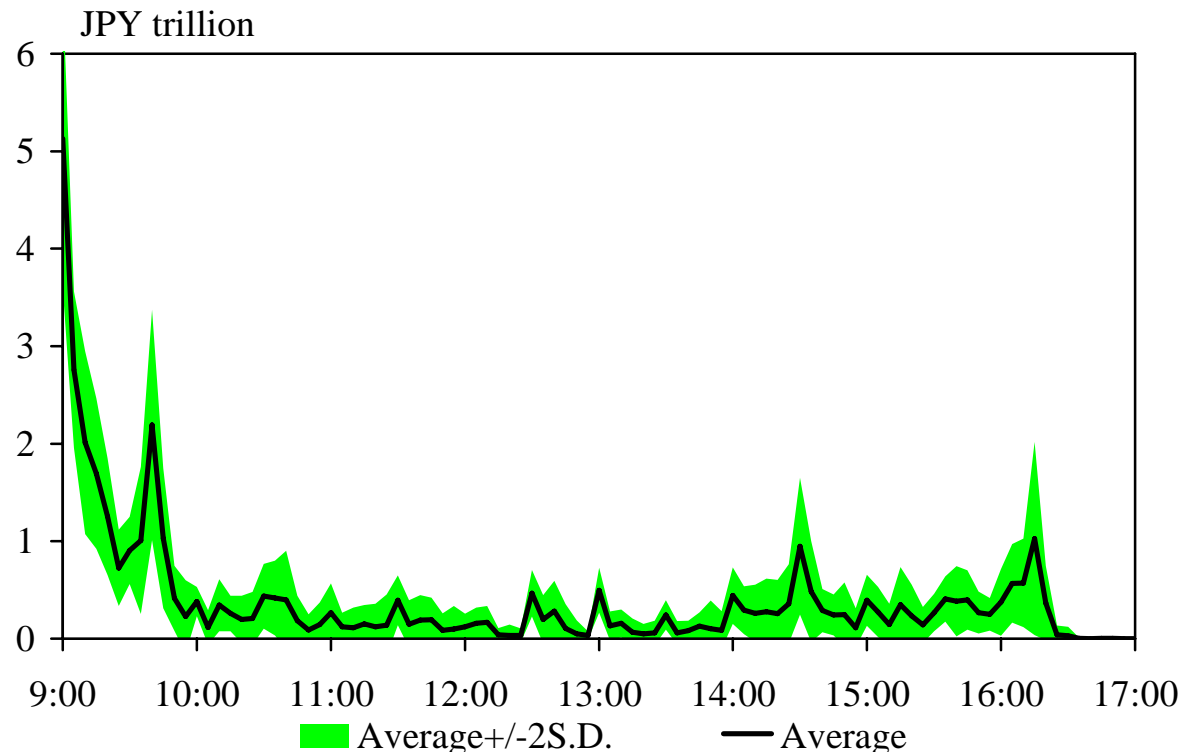
Cumulative Distribution of Intraday Settlement

- The intraday RTGS activities seem to consist of two parts: morning and afternoon sessions.
  - These two parts are symmetric.
  - Both of them are not volatile but extremely stable.

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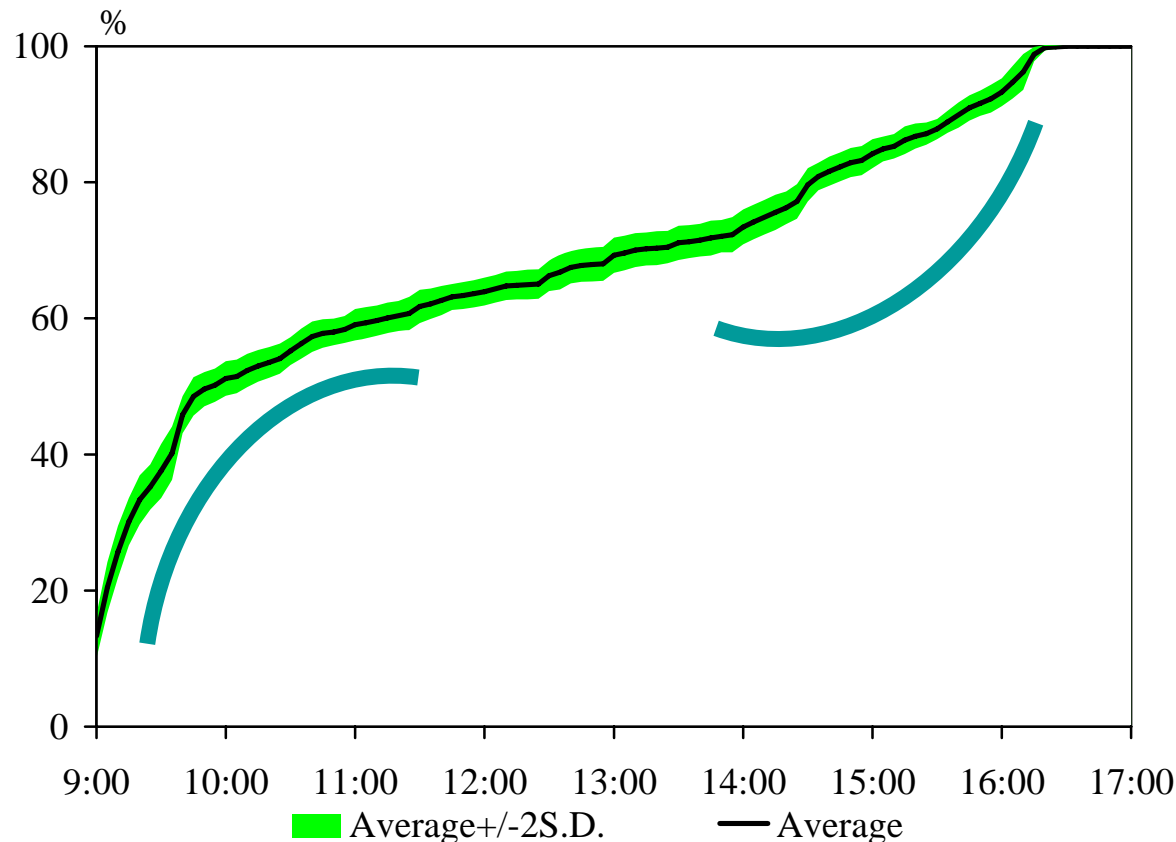
Determinant Factors of Morning Activities

- Morning shape: concave-like.

- Repayment-first rule (market practice for call money transactions):

  - Borrowers should start repaying call loans immediately after 9:00 (starting time of the BOJ-NET), and make every effort to complete repayment before 10:00.

- Repayment-first rule encourages large amount of independent payments to be settled at the beginning of the day. It also fixes each bank's intraday liquidity position during the repayment period (9:00-10:00), and eliminates uncertainty of changes in each bank's balance.

Determinant Factors of Afternoon Activities

- Afternoon shape: convex-like.

- Designated-time settlement:
  - Net positions of yen legs of FX transactions and retail credit transfers are settled at 14:30 and 16:15 respectively.

- Because liquidity positions are not finally fixed until the designated-time, reactive payments are less responsive to incoming payments.
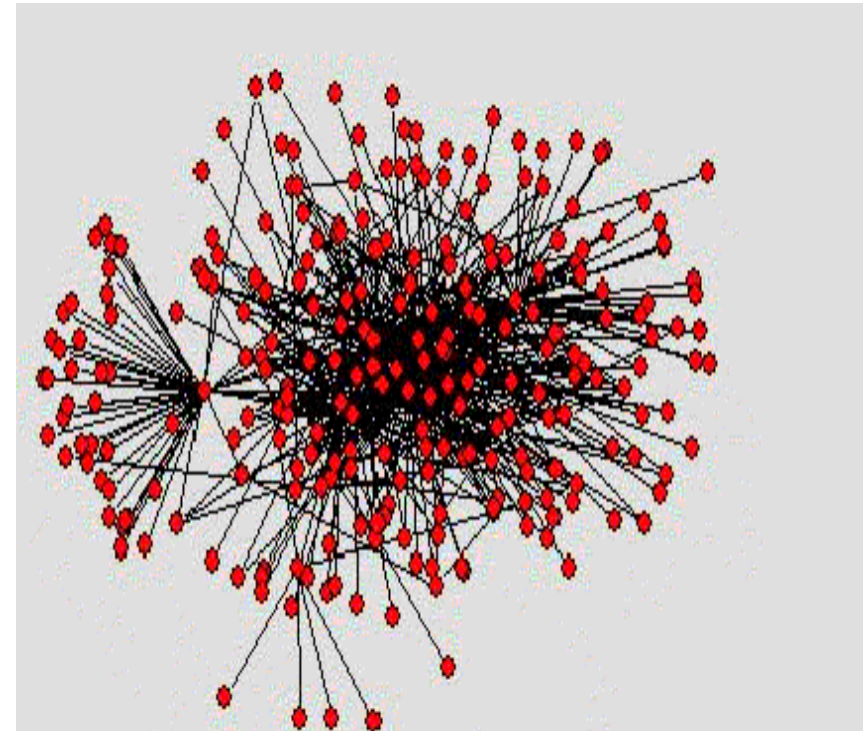
Differences between Morning and Afternoon (1)

- Size of the interbank network in the morning is larger than that in the afternoon in terms of number of nodes and sum of in- and out-degrees.
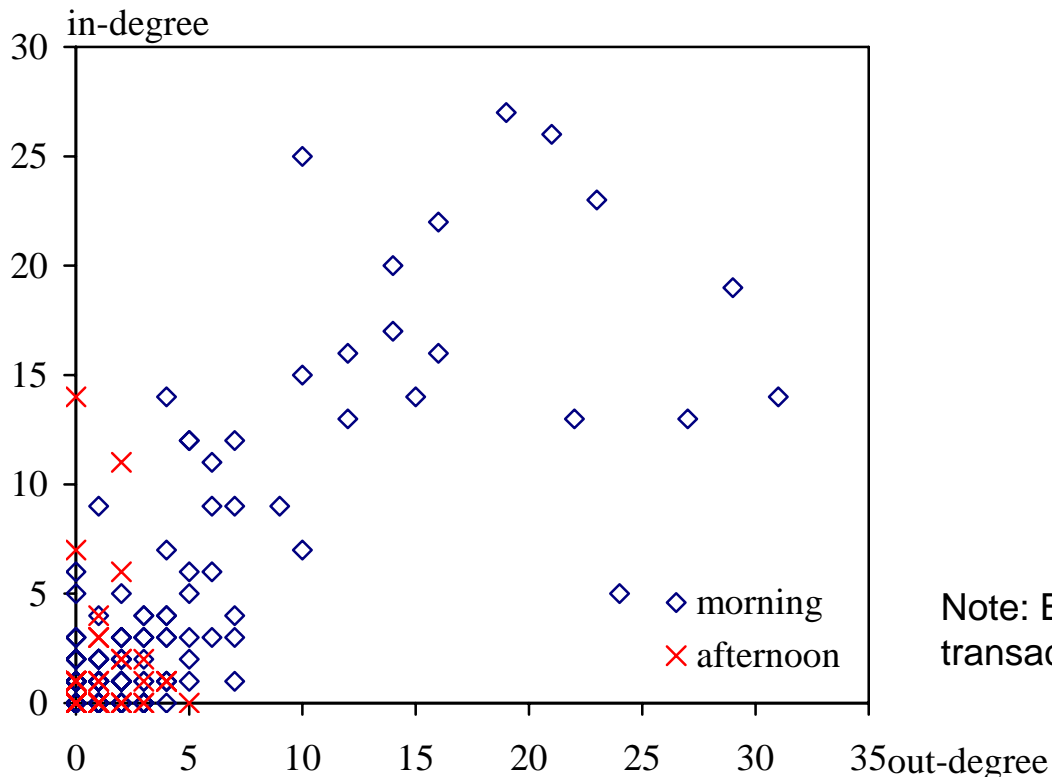
Morning Session
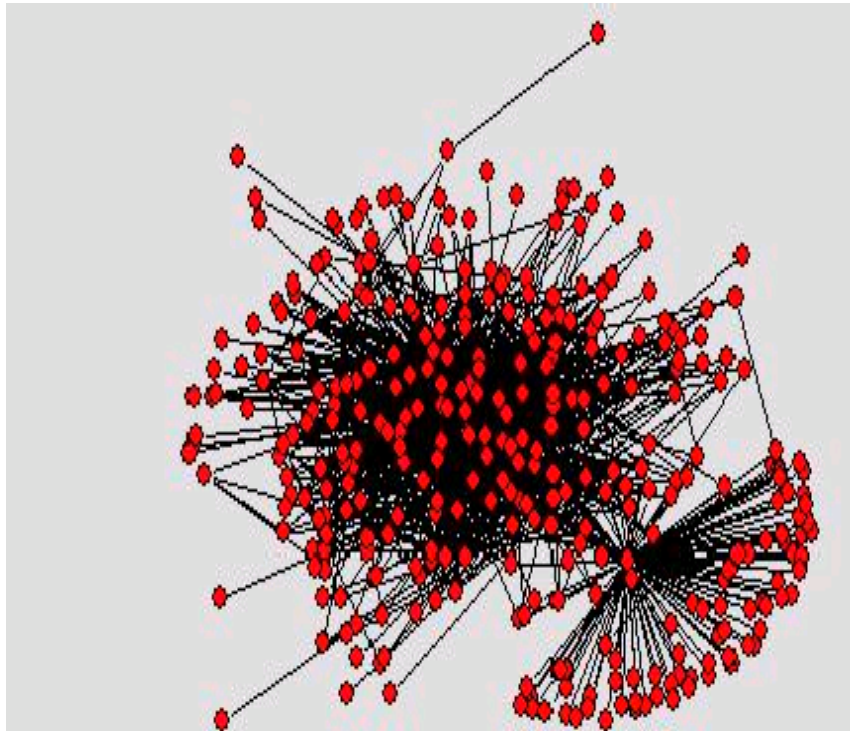
Afternoon Session

Differences between Morning and Afternoon (2)

- Many banks made outgoing and incoming payments with a number of counterparties in the morning, and only several banks with a few counterparties in the afternoon.

Note: Both in- and out-degrees are calculated on transactions greater than JPY 10 million.

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Differences between Morning and Afternoon (3)

- ## Morning and afternoon sessions have different distributions of average value per transfer.
  - Morning session: double-peaked around JPY 3-8 million and JPY 9-26 billion.
 - Afternoon session: single-peaked around JPY 9-26 billion.
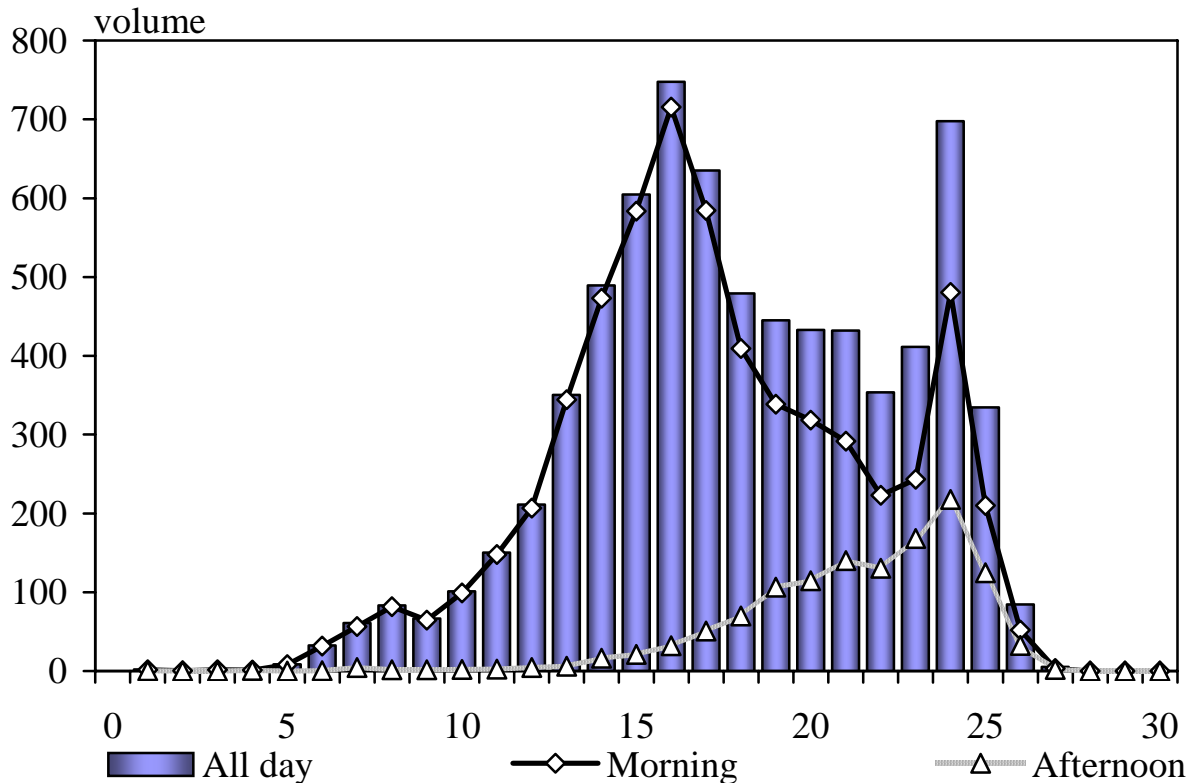
Note: X-axis is a logarithmic scale.

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Simulation Scenario

- Does prompt and smooth RTGS remain feasible with increased "stress"?
  - Extra stress can delay outgoing payments.
  - Types of stress: increase in amount of payments; decrease in settlement funds (eg BOJ balances); and rise in interest rates and credit risk premiums.

- Assume that each bank sets a higher level of a credit limit as "stress" increases , and that each bank follows a rule-based reaction.
  - If a credit limit is reached, a bank stops making payments. If a credit limit is not reached, a bank goes on making payments.
  - In the worst case, credit limits are set equal to the session's net position of each bank. In the benchmark case, there is no credit limit.

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Simulation Results (1)

- Maximum rate of deviation from the benchmark case is 38% in around 12:45-13:10.
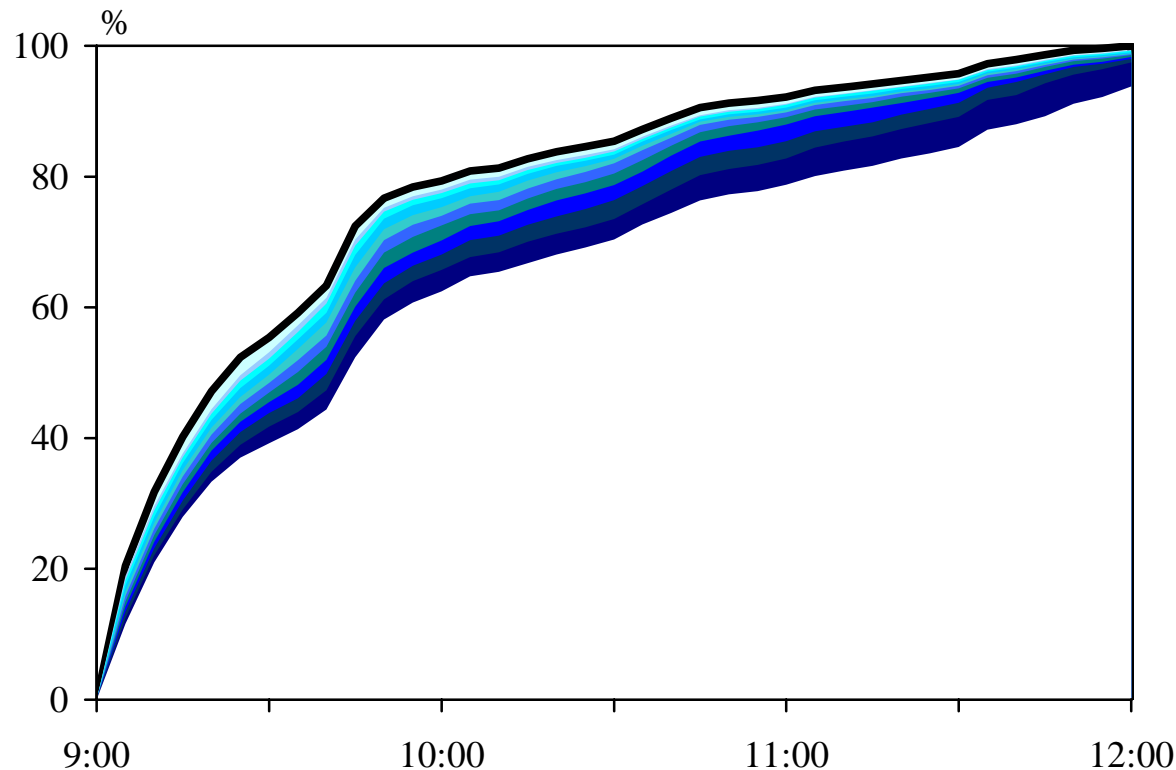- Maximum rate of unsettled payments at 17:00 is 14%.
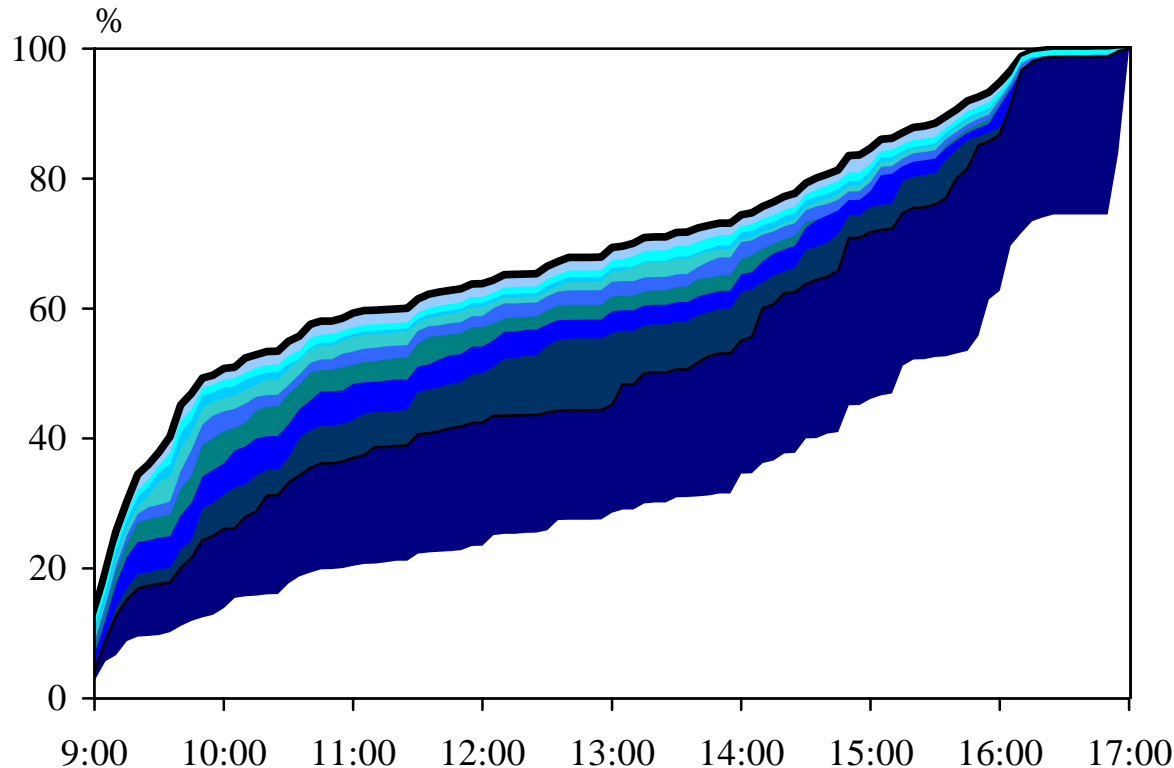
Notes: The simulations are performed 693 times (!) using actual data of 21 consecutive business days in Dec. 2005.
The bold black line shows the benchmark case. The lower bound shows the worst case.

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Simulation Results (2)

- Maximum rate of deviation from the benchmark case is 20% at around 9:45.
- Maximum rate of unsettled payments at 12:00 is 6%.

Notes: The bold black line shows the benchmark case. The lower bound shows the worst case.

Simulation Results (3)

- Maximum rate of deviation from the benchmark case is 7% in around 13:35-16:00.

- Maximum rate of unsettled payments at 17:00 is 0%.
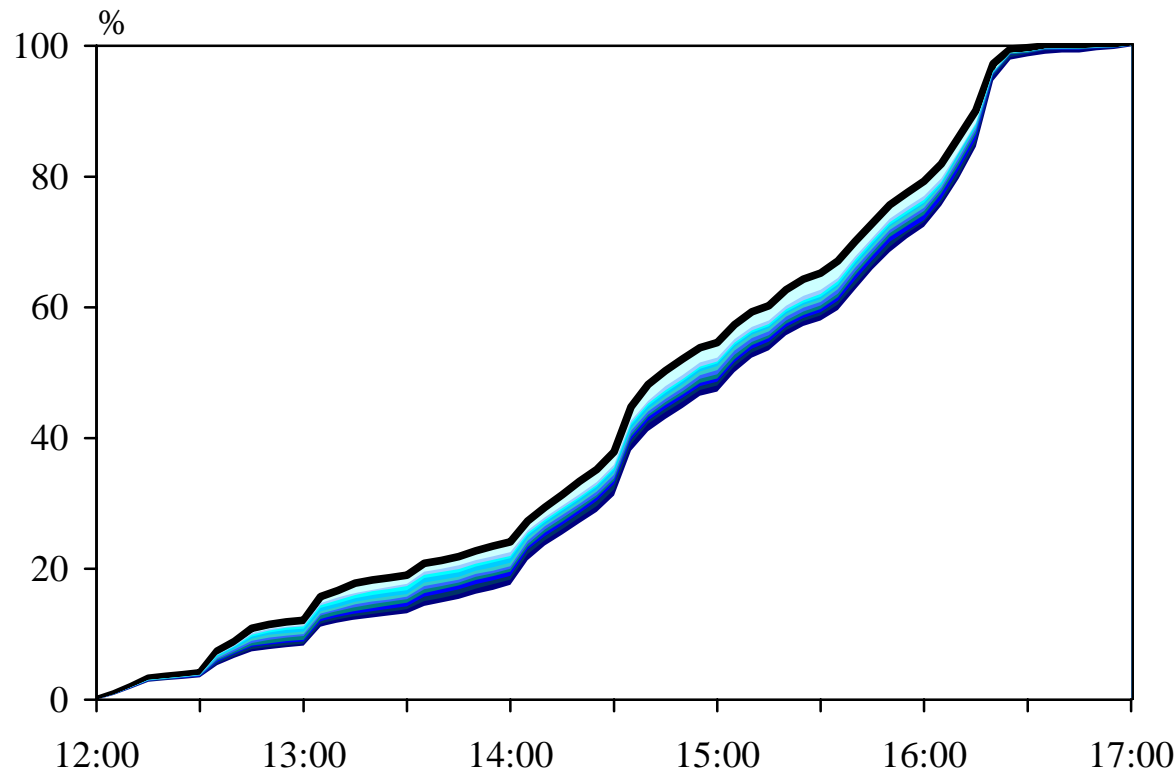
Notes: The bold black line shows the benchmark case. The lower bound shows the worst case.

Simulation Results (4)

- When "stress" is building up, the shape of the morning activities get distorted and becomes close to a convex-like curve.
  - One bank's settlement delay can easily spread to others because of the complicated network.
  - Since banks raise funds given the repayment-first rule, they are less flexible to unexpected changes in intraday RTGS activities.
- On the other hand, the shape of the afternoon activities is hardly changed.
  - The coarse network can prevent one settlement delay from affecting other settlement.
  - Settlement delay is unacceptable in the afternoon because of designated-time settlements.

Conclusion

- There are at least two different shape of networks in a day, based on the interdependent relationship in the morning and the independent relationship in the afternoon.

- "Stress" of RTGS tends to make the shape of intraday RTGS activities convex-like. The shape of the afternoon activities is more stable than that of the morning ones.

- One of the alternative measures to maintain smooth RTGS is to introduce liquidity-saving facility (eg offsetting mechanism) into the BOJ-NET RTGS. The liquidity-saving facility is expected to reduce "stress" especially at the beginning of the day.