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BANCO CENTRAL DO BRASIL
Insolvency and Contagion in the Brazilian Interbank Market

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Contribution

➢ To map systemic risk sources and related losses in the Brazilian interbank market:

❐ Identifying FIs that are potential contagion sources;

❐ Computing contagion losses:
  ➢ Losses related to FIs’ defaults;
  ➢ 1-year horizon expected losses;
  ➢ Other markets contagion losses due to shocks in the interbank market.

❐ Identifying the contagion route within the financial system.
Learning from the Crisis

Before the 2008 crisis
- Microprudential approach: aimed at the mitigation of a single FI risk.
- Financial systems are stable if each of their components is stable.
- Analyses show that banking systems are stable.

Since the 2008 crisis
- Initially: identification of crisis factors and amplifier mechanisms
- Among the amplifier mechanisms (Brunnermeier (2009)):
  - Loss and margin spirals
  - Runs to FIs
  - Credit restriction due to capital restriction
Currently

- Regarding the Financial Stability, it is important to take into account:
  - A Liability network analysis;
  - A Macroprudential approach (oriented to mitigate the systemic risk);
  - The stability of the agents’ expectations, in an environment of strong risk aversion: decisions taken may change abruptly.

- Challenges for predicting and managing crisis: behavioral modeling in rare events and continuous reorganization of the financial system (Upper(2011)).

- Nevertheless, it is important to identify SIFIs and to quantify losses related to contagion mechanisms, if they materialize.
Approach

- Gathering of information about the liability network in the IB market and about possible interferences this market provokes on others.

- Simulation of default cascades starting from an initial default.

- Simulated contagion channel: through the balance sheet.

- Analysis considers the solvency of FIs, i.e., its net worth, not their liquidity.
Methodology

- Based on the Eisenberg and Noe’s (2001) clearing algorithm with several enhancements/modifications.

- This algorithm allows the calculation of losses due to the default of one or more FIs of the financial system network.

- This process identifies the FIs which default is not completely absorbed by their creditor FIs’ capital buffers. In this case, these creditor FIs will default and, possibly, contaminate other markets.

- The methodology can be used in the calculation of one-year horizon expected losses for FIs and for the financial system.
Methodology - Assumptions

- The default propagation is immediate: the FI’s solvency is assessed immediately and, if insolvent, the FI is liquidated. There is no bailout.

- The recovery rate of the defaulting FIs is zero in the simulation’s time horizon. We assume their assets are frozen during this period.

- Creditor FIs are given priority over shareholders in the receipt of payments.

- The capital buffer is assumed to be the Capital (Tier 1 + Tier 2) amount that exceeds 8% of risk-weighted assets.
Methodology – Solvency

- Initially, the FIs' positions are unwound:

- The Capital Buffer is calculated as if the IF did not have interbank market assets and liabilities.

- If Capital Buffer < 0, we assume Capital Buffer = 0 and a liability to a fictitious FI, which represent other markets.

- FI losses contaminate other markets if:
  - Loss (assets) > Capital Buffer + Total liabilities

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Methodology – Contagion

- We simulate the contagion process that may arise from each financial institution’s default.

- The contagion process modeled occurs through the balance sheet:
  - If a FI defaults, it does not pay any liabilities in the interbank market.
  - The creditor FIs are forced to write off the corresponding assets from their balance sheets.
  - These losses shall be absorbed by their Capital Buffers to restore the balance sheet equilibrium.
A Debtor Defaults – Enough Buffer

C: Cash; L: Loans; D: Deposits; IB: Interbank; OMB: Other Mkts Borrowings

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A Debtor Defaults – Contagion to the FI

C: Cash; L: Loans; D: Deposits; IB: Interbank; OMB: Other Mkts Borrowings
A Debtor Defaults – Contagion also to Mkts

C: Cash; L: Loans; D: Deposits; IB: Interbank; OMB: Other Mkts Borrowings
Simulation Process

Data: capital buffers (after unwinding), liabilities’ matrix

Verify solvency:
Buffer + \(\Sigma\) Recpts \(\leq\) \(\Sigma\) Paymts
for, at least, 1 FI?

YES

Zero defaulted IFs’ payments in liabilities’ matrix

(New defaults)

NO

Results: capital buffers, total losses, losses propagated to other markets (contagion)
Sample

  - 12 state-owned, 247 Brazilian private institutions, 55 foreign institutions.
  - Main FIs' segments in the sample are banks and credit unions.
  - Data from the Central Bank of Brazil Financial System Monitoring Department.
- Calculations: short-term effects.
Losses: 20% IB market assets. Peak: Nov/2011 (in Sep/2008: 53%)

Aggregated FIs' LGDs each month:
- It is a measure of the aggregated Fis’ vulnerability
- The chart shows the sum of the contagious losses calculated for FIs' fictitious defaults in different simulations.
The number of FIs that default due to contagion is relatively high and stable during the period of analysis.

The losses’ volume followed the same pattern.
Contagion Route – June/2012 – Details
FI Losses

- On average, 27 FIs defaulted due to contagion in each round of fictitious defaults.
- The most vulnerable FIs defaulted due to four different counterparties in a round (month/year).
- These FIs are mostly private domestic. Those that are not, are state-owned or foreign.
- Regarding contagion to other markets, their aggregate losses were almost 100% of the aggregate loss on each month in the analysis period. This shows that the vulnerable FIs are highly exposed to the IB market.
The expected value of losses in the one-year horizon has not undergone abrupt changes during the period.

On June/2012, the financial system expected losses related to the IB market were about 0.6% total IB assets.
Conclusions

- Few FIs originated insolvency contagion.
- Some big FIs originate lower contagion than some medium ones.
- The framework may be useful for policy making / surveillance:
  - To identify/assess systemic vulnerabilities associated to one or more markets.
  - Stress-testing.
Next steps

➢ To extend the framework to assess risks in a set of markets, not necessarily aggregating them.

➢ To include liquidity mechanisms into the analysis.

➢ To identify and understand plausible losses’ amplifier mechanisms, many of which have behavioral components, to include them into the model.
THANK YOU