Financial Stability with Sovereign Debt

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Motivation

Two key issues in financial stability since the recent financial crisis

- Government guarantees
- Financial regulation

- Guarantees: deposit insurance ended historical banking panics; should it be expanded?
- Regulation: stricter regulations were introduced to end government guarantees (e.g. Dodd-Frank Act)

The negative feedback loop between banks and government
- A shock in banking sector hurts sovereign
- The worse fiscal situation hurts the banking sector

Question: Which approach is the best to promote financial stability given this loop?
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The negative feedback loop

- Tax: credit crunch $\Rightarrow$ real economic activity $\downarrow \Rightarrow$ tax base $\downarrow$
- Guarantee: liquidity shortage $\Rightarrow$ transfers $\Rightarrow$ debt level $\uparrow$
- Bond price: worse fiscal situation $\downarrow \Rightarrow$ bond price $\downarrow \Rightarrow$ valuation loss
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This paper

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- compares government guarantee, liquidity regulation, and a mix of them.
This paper

- **studies** sovereign default together with self-fulfilling bank runs
- **models** the negative feedback loop between banks and the government
- **compares** government guarantee, liquidity regulation, and a mix of them
- **derives** conditions under which each policy regime is effective
Baseline Model
Mechanism

Diamond Dybvig model with a defaultable asset

- Agents: Depositors, Banks, (Outside) Investors and Government
- Time period: $t = 0, 1, 2$
Mechanism

Period 0
- Depositors deposit to Banks

Period 1
- Withdrawal from Depositors to Banks
- Repayment to Investors
- Loan (liquidation) between Banks and Investors
- Bond transfer

Period 2
- Withdrawal from Depositors to Banks
- Repayment to Investors
- Loan (matured) between Banks and Investors
- Bond transfer
Model setup

- Fraction $\lambda$ of depositors will be impatient and withdraw in period 1.
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Model setup

- Fraction $\lambda$ of depositors will be impatient and withdraw in period 1.
- Patient depositors withdraw either in period 1 or in period 2.
- A bank run occurs if patient depositors withdraw in period 1.
- Sovereign default occurs if the government cannot levy sufficient tax to repay bonds.
Efficient allocation

- Banks redeem a withdrawal by returns of \(\{\text{bond, loan}\}\) in period \(\{1\}\)
- \(\{\text{Impatient, Patient}\}\) depositors withdraw in period \(\{1\}\)
- Bond prices are determined through arbitrage with outside options
Bank run
A Bank Run

**Period 0**

- **Depositors** → **Banks** (deposit)
- **Banks** → **Loan**
- **Loan** → **Investors** (initial debt)

**Period 1**

- **(impatient) withdrawal** → **Banks** (repayment)
- **Banks** → **Loan (liquidation)**
- **Loan (liquidation)** → **Investors**

**Period 2**

- **(patient) withdrawal** → **Banks** (repayment)
- **Banks** → **Loan (matured)**
- **Loan (matured)** → **Investors**

**Government** (outside option)
A Bank Run

Period 0

Depositors deposit → Banks

Government (initial debt)

Investors (outside option)

Period 1

(patient) (impatient)

withdrawal → (red arrow) repayment → Banks

Loan (liquidation)

Bond

Investors

Period 2

withdrawal → repayment → Banks

Government

Loan (matured)

Bond

Investors

Extra withdrawals
A Bank Run

**Period 0**

- **Depositors** deposit to **Banks**
- **Government** (initial debt)
- **Investors** (outside option)

**Period 1**

- **(patient)**
  - **(impatient)**
  - **withdrawal**
  - **Banks** repayment
  - **Loan** (liquidation)
  - **Bond**
  - **Investors**

**Period 2**

- **withdrawal**
  - **Banks** repayment
  - **Loan** (matured)
  - **Bond**
  - **Investors**

- Liquidation
A Bank Run

\[\text{Depositors} \rightarrow \text{Banks} \rightarrow \text{Government} \]

\[\text{Loan (initial debt)} \]

\[\text{Investors (outside option)} \]

\[\text{Loan (liquidation)} \]

\[\text{Loan (matured)} \]

\[\text{Bond} \]

\[\text{withdrawal} \quad \rightarrow \quad \text{repayment} \]

\[\text{(patient)} \quad \text{(impatient)} \]

\[\bullet \quad \text{Liquidation} \Rightarrow \text{Tax base} \downarrow \]
A Bank Run

Period 0
- Depositors deposit into Banks

Period 1
- Deposit becomes loan to government
- (patient) (impatient) withdrawal by Depositors
- Repayment by Banks
- Bond to Investors
- Government loan (initial debt)
- Investors (outside option)

Period 2
- Withdrawal by Depositors
- Repayment by Banks
- Bond to Investors
- Government loan (matured)

Liquidation ⇒ Tax base ↓ ⇒ Default
A Bank Run

- **Period 0**
  - Depositors deposit to Banks
  - Banks receive deposits from Depositors and lend to Investors
  - Government (initial debt) and Investors (outside option)

- **Period 1**
  - (patient) (impatient) withdrawal from Depositors
  - Depositors receive repayment from Banks
  - Banks receive repayments from Depositors and lend to Investors
  - Loan (liquidation)
  - Bond
  - Investors

- **Period 2**
  - (patient) (impatient) withdrawal from Depositors
  - Depositors receive repayment from Banks
  - Banks receive repayments from Depositors and lend to Investors
  - Loan (matured)
  - Bond
  - Investors

- Liquidation $\Rightarrow$ Tax base $\downarrow$ $\Rightarrow$ Default
A Bank Run

Period 0

Depositors deposit → Banks

⇒

Tax base ↓ ⇒ Default ⇒ Bond price ↓

Period 1

Withdrawal

Banks repayment

Loan (liquidation)

Bond

Investors

Government

(initial debt)

Period 2

Withdrawal

Banks repayment

Loan (matured)

Bond

Investors

Government

Liquidation ⇒ Tax base ↓ ⇒ Default ⇒ Bond price ↓
A Bank Run

Liquidation ⇒ Tax base ↓ ⇒ Default ⇒ Bond price ↓ ⇒ Liquidation...
Policies

- The bank run equilibrium always exists in the baseline model.

Q. Do any of following policies eliminate the run equilibrium?

1. Liquidity regulation
2. Government guarantees
3. A mix of these policies
**Liquidity Regulation**

- **Example**: Liquidity Coverage Ratio (LCR)

\[
LCR = \frac{\text{Stock of high quality liquid assets (HQLA)}}{\text{Total net cash outflows over the next 30 calendar days (NCOF)}}.
\]

### Diagram

**Period 0**
- **Depositors** deposit into **Banks**
- **Investors** buy **Bonds**
- **Government** provides **Loan**

**Period 1**
- **Depositors** withdraw, **Banks** repay
- **Loan** (liquidation)
- **Investors** sell **Bonds**
- **Government** (initial debt)

**Period 2**
- **Depositors** withdraw, **Banks** repay
- **Loan** (matured)
- **Investors** buy **Bonds**
- **Government** (outside option)
Liquidity Regulation

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\]

Diagram:
- **Period 0:** Depositors deposit to Banks. 
  - LCR (initial debt) to Government.
  - Investors (outside option).
- **Period 1:** Depositors withdraw to Banks.
  - Repayment to Investors.
  - LCR (liquidation).
- **Period 2:** Depositors withdraw to Banks.
  - Repayment to Investors.
  - LCR (matured) to Government.
Liquidity Regulation

- may prevent a run.
- but, it distorts the allocation if it binds.
- and, it may cause sovereign default if it’s too tight.
Government Guarantees

- No costly liquidation if the government can raise funds
- The government has higher accumulated debt to repay in period 2
- The credibility of guarantees depends on debt sustainability
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Policy Mix

- Liquidity regulation requires banks to have excess liquidity.
- The transfer mechanism is identical to Guarantee.
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**Period 0**
- **Depositors** deposit to **Banks**
- **LCR**

**Period 1**
- Withdrawal by (patient) and (impatient)
- Repayment to **Banks**
- **Guarantee**
- **Government**
- **Investors**

**Period 2**
- Withdrawal by (patient)
- Repayment to **Banks**
- **Loans**
- **Government**
- **Investors**
Results

Which policy is more effective?

Guarantee is effective in economies with high returns and low debts. If the returns decrease or debt increases, Guarantee is ineffective.
Results
Which policy is more effective?

- Guarantee is effective in economies with high returns and low debts
Results

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- Guarantee is effective in economies with high returns and low debts.
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- But, Guarantee may work if combined it with liquidity regulation.
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- If the returns ↓ or debt ↑, Guarantee is ineffective
- But, Guarantee may work if combined it with liquidity regulation
- In some cases, only Liquidity regulation alone is effective
Conclusion

Findings:

▶ **Guarantee**
  - do not distort the allocation
  - effectiveness depends on debt sustainability

▶ **Liquidity regulation**
  - distorts the allocation if it binds
  - causes a sovereign default if too strict

▶ **Policy mix**
  - can complement government guarantees
  - but less effective than liquidity regulation alone in some cases