Linkages across Sovereign Debt Markets
Arellano and Bai - 2013

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Sargent Reading Group
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• Sovereign debt crises occur in tandem.
  • GIIPS in Eurozone crisis.
  • Latin America in 1980s.
  • Reinhart and Rogoff (2011): systematic clustering in last 200 years.

• Multicountry model of contagion based on
  • Common lenders
  • Renegotiation

• Mechanism explains half the correlation of Greek and Italian spreads.
  • It alone predicts a correlation of spreads of 43% (97% in data)
  • Predicts 30% correlation of borrowing, 56% in data.
• Two countries: Home and Foreign.
• **Risk-averse** competitive external lenders.

After default
  • Direct output cost,
  • Exclusion until **renegotiation**.

• **Price of debt reflects**
  • Cost of funds for lenders,
  • Risk-adjusted default **probability**,
  • Risk-adjusted **recovery** rate.

• Default probability and recovery rate are **correlated** across countries.
  • *Only* because of **common** lenders.
• Both countries are symmetric.
• Receive stochastic endowment $y^i_t$
  • Markov with transition $\pi(y', y)$.
• Issue debt $b^i_t$ and decide whether to repay, to maximize
  \[
  \mathbb{E}_t \left[ \sum_{s=0}^{\infty} \beta^s u(c^i_{t+s}) \right]
  \]
• Lenders have endowment $y_L$, utility $g(\cdot)$ and discount $\delta > \beta$.
• Vector of relevant states is
  \[
  s = \{b, h, y\}
  \]
  • $h^i_t = 0$ means that country $i$ has good credit standing.
• Repayment decision
  • Countries decide simultaneously
• New Borrowing
  • Also simultaneous
• Consumption
• Without default \((d_i = 0)\), country \(i\)'s budget constraint is

\[
c_i(s, b', d) = y_i - b_i + q_i(s, b', d)b'_i
\]

• If \(i\) defaults at \(t\),
  • No borrowing at \(t + 1\) output loss (as in Arellano, 2008), so

\[
c_i(s, b', d) = y_i^d = \begin{cases} 
  y_t & \text{if } y_t \leq (1 - \lambda)\bar{y} \\
  (1 - \lambda)\bar{y} & \text{if } y_t > (1 - \lambda)\bar{y}
\end{cases}
\]

  • \(h_{t+1}^i = 1\).
  • To set \(h_i = 0\) again, \(i\) needs to pay the recovery \(\phi_i(s, b', d)\).

\[
c_i(s, b', d) = y_i - \phi_i(s, b', d), \quad b'_i = 0
\]

• Countries choose when to reenter
  • Recovery \(\phi\) is Nash-bargained with the lenders.
• Value function for $i$

$$v_i(s, b', d) = u(c_i(s, b', d)) + \beta \sum_{y'} \pi(y', y) v_i(s')$$

• Borrowing is **Nash** when both countries have good standing
  • Both $q$ and $v(s')$ are affected by $b'_{-i}$.

• When only $i$ has good standing, $-i$’s actions are predetermined.
• If $i$’s renegotiation fails, gets financial autarky forever with

$$v_{i, aut}(y) = u(y_i^d) + \beta \sum_{y'} \pi(y', y)v_{i, aut}(y')$$

• $v_{i, aut}$ is independent of what happens to $-i$.

• If $i$ excluded, lenders get value from single-country eq’m $V_f^L(s_{-i})$

• If both excluded, lenders get endowment

$$V_{aut}^L = \frac{g(y_L)}{1 - \delta}$$

• Lenders price bonds so $V_{aut}^L \leq V_f^L(s_{-i})$
• Joint renegotiation: lowest recovery
• ‘Solo’ renegotiations: highest recovery, very rare.
RENEGOTIATION INCENTIVES

• Lenders price bonds so

\[ Q_i = \sum_{s'} \left[ m(s', s) \left( 1 - D_i(s') (1 - \zeta_i(s')) \right) \right] \]

\[ \zeta_i(s) = \sum_{s'} \left[ m(s', s) \left( (1 - D_i(s')) \frac{\phi_i(s')}{b_i} + D_i(s') \zeta_i(s') \right) \right] \]

• Bond prices for \( i \) reflect default incentives of both countries.
• The worst state for the lenders is joint renegotiation.
• If $i$ borrows more, default more likely, lower price
• If $i$ defaults, default more likely, lower price
- If \(-i\) borrows more, default also more likely, lower price
• If \(-i\) renegotiates, lenders in good position, default less likely.
### Dependence

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- 98% of dependent defaults happen because the other country defaults. 2% because it is not renegotiating.
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- All the dependent repayments happen because the other country repays.
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- Of dependent renegotiations, 55% because other renegotiates, 39% because other repays.
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- All the dependent nonrenegotiations happen because the other country is defaulting.
CONCLUDING REMARKS

• Multicountry model of sovereign debt
  • Emphasizes debt linkages through common creditors as only channel.

• Strong prevalence of synchronized defaults
  • Default abroad lowers the price of debt at home
  • Default abroad lower recoveries at home.

• Explains significant portion of interest rate correlations.