Discussion: Minimization of Systemic Risk as an Optimal Network Reorganization Problem - The Case of Overlapping Portfolio Networks in the European Government Bond Market

Anton Pichler, Sebastian Poledna, and Stefan Thurner

Jorge A. Chan-Lau
jchanlau@imf.org

Institute for Capacity and Development, International Monetary Fund, and Credit Research Initiative, National University of Singapore

Second Conference on Network Models and Stress Testing for Financial Stability
Mexico City, September 26-27, 2017

The views presented herein do not represent those of the IMF, its Executive Board, or IMF policy.
Main Messages

Modeling strategy

- **Multilayer network**
  - Captures connectedness via common exposures
  - Salient feature of real world financial networks

- Specializes DebtRank (Battiston et al, 2012)
  - from direct exposure to common exposures

- Endogenizes impact of fire-sale of assets
  - Kyle (1985) price impact model

- Shows systemic risk minimization is feasible
  - Rebalances banks’ sovereign bond portfolios
    - Minimize impact of default
    - Banks’ original risk profile unchanged
Achieved by reducing the system total DebtRank

Intuition
- Increase homogeneity in the system
- Reduce DR of banks with high DR
- Increase DR of banks with low DR

Constraints faced by banks in minimization problem
- Value new allocation = Value old allocation
- Returns at least equal to original allocation return
- Variance at most equal to original allocation variance

Would results hold when faced with other constraints?
Real world constraints: Capital

- Banks need to hold capital against risky assets
- Let
  - $K_i$ be original total capital of bank
  - $x_{ki}$ the new sovereign bond allocation
  - $RW_k$ the risk-weight associated with sovereign bond $k$
- We need a capital allocation constraint

$$\sum_k RW_k \times x_{ki} \leq K_i$$
Real world constraints: Concentration limits

- Banks need to meet concentration limits
- Let $L_k$ be the concentration limit for bond $k$
- We need a concentration limit constraint

\[ \frac{x_{ki}}{\sum_k x_{ki}} \leq L_k \]
Main Messages

Real world constraints: Liquidity

- Banks need to hold liquid assets
- Let
  - $Liq_i$ be the required liquidity the bank holds
  - $x_{ki}$ the new sovereign bond allocation
  - $h_k$ the haircuts for asset $k$
- We need to ensure the bank has enough liquidity

\[
\sum_{k} h_k \times x_{ki} \geq K_i
\]
Thank You