Systemic Risk and the Optimal Seniority Structure of Banking Liabilities

Spiros Bougheas

University of Nottingham

Alan Kirman

University of Aix-Marseilles

Introduction

The value of the assets of a bankrupt entity is below the value of its liabilities. *Bankruptcy procedures* are designed to allocate *priority rights* among the various claimants of the entity's assets. Their design includes:

- *Priority Rules:* They specify a hierarchy among creditors such that in liquidation a group of creditors must be satisfied in full before any other group of creditors lower in the ladder receive any payments.

- *Pro-Rata Rule:* All creditors belonging, according to priority rules, to the same level are compensated proportionately to the amount of their individual claims.

The design of priority rules for banks has attracted a lot of attention in the aftermath of the 2008 crisis. Globally there is a large variety of

- bankruptcy procedures (Berkovitch and Israel, 1999)

- priority rules (Lenihan, 2012; Wood, 2011)

Australia, Switzerland, US: well established depositor preference rules.

Greece, Portugal, Hungary, Latvia, Romania: implement such rules as conditions that they need to meet in order to participate in EU/IMF programmes.

UK: the Vickers report recommends the introduction of a depositor preference rule (ICB Report 2011).

Arguments supporting priority rules are based on the incentives that these rules provide to depositors and other creditors to monitor the activities of bank managers.

However, bankruptcy rules that might be optimal responses to individual bank failures might not be efficient when the crisis is systemic (Dewatripont and Freixas, 2012)

Research Questions:

What are the welfare consequences of the allocation of priority rights when we allow for systemic risk?

How is the network structure affected by the allocation of priority rights?

Literature Review (Theoretical Arguments)

Demandable debt (N-DPR): Calomiris and Kahn (1991)

Interbank market monitoring incentives (DPR): Rochet and Tirole (1996)

Bank informational advantage (DPR): Birchler (2000)

Monitoring/screening services (N-DPR/DPR): Freixas, Rochet and Parigi (2004)

Secured debt (*de facto* N-DPR): Bolton and Oehmke (2015)

Note: Only Rochet and Tirole (1996) consider systemic risk

Preliminary Results

Result 1 *In the absence of fire sales neither the structure of the interbank network nor priority rules matter for total losses. Priority rules only matter for the division of losses between depositors and equityholders.*

Result 2 *Suppose that the formation of the banking network is independent of the structure of priority rules. Then, when liquidation is costly (fire sales) total losses are higher under depositor priority.*

The Model

4 *banks:* A, B, C, D.

2 types of risk-neutral agents: *bank owners* and *depositors*.

Assets: *customer loans*, L_i; loans offered to other banks, l_i^j.

Liabilities: *customer deposits*, D_i, deposits from other banks, d_i^j; equitry, E_i.

Balance sheet identity

$$L_i + \sum_{j \neq i} l_i^j = D_i + \sum_{j \neq i} d_i^j + E_i, \quad \forall i$$

Interbank market constraints

$$l_i^j = d_j^i, \quad \forall i \text{ and } \forall j.$$

Table 1: Initial Bank Balance Sheets

$L_A = 1$	$D_A = 1$
$Assets = 1$	$Liabilities = 1$

$L_B = 1$	$D_B = 2$
$l_B^C = 1$	
$Assets = 2$	$Liabilities = 2$

$L_C = 2$	$D_C = 1$
	$d_C^B = 1$
$Assets = 2$	$Liabilities = 2$

$L_D = 1$	$D_D = 1$
$Assets = 1$	$Liabilities = 1$

- *Net interest rate on consumer loans:* $0 < z < 1$

- *Net interest rate on deposits:* 0

- *Net interbank interest rate is also:* 0

Scenario: Bank D obtains an extra unit of deposits that is willing to loan to another bank. All other three banks can fund an extra unit of consumer loans.

- *Welfare: Total Deposits plus Total Profits*

Questions:

- Assuming that depositors have priority over banks, to which other bank will bank D offer the loan to maximize its profits?

- Assuming that depositors have priority over banks, which bank should receive the loan to maximize social welfare?

- Assuming that banks have priority over depositors, to which other bank will bank D offer the loan to maximize its profits?

- Assuming that banks have priority over depositors, which bank should receive the loan to maximize social welfare?

Initial Network

A   B → C   D

D *offers a loan to*

A   B   C

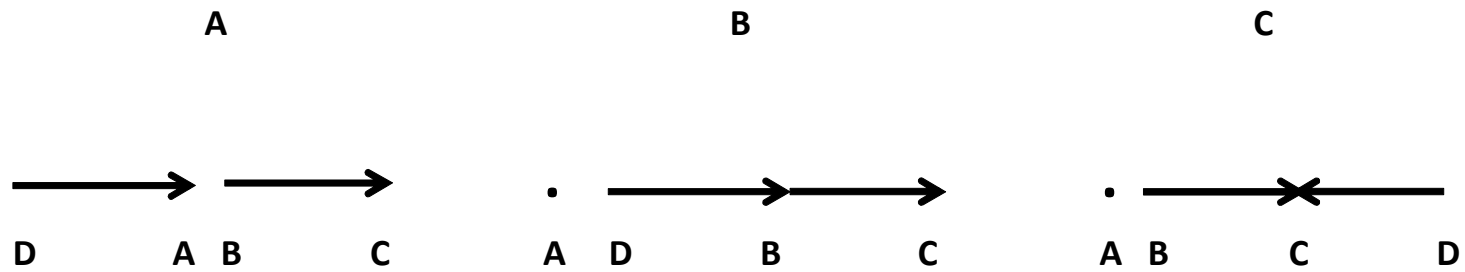D → A B → C   A D → B → C   A B → C ⤫ D
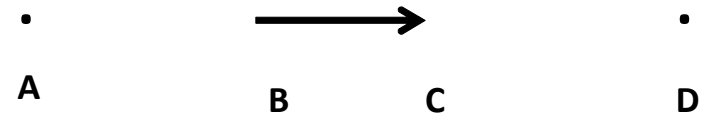
Figure 1: Network Structure

Remark 1 *The four questions matter only when a bank other than D goes into liquidation. Thus, we assume that one of the other three banks has to write off some of its assets.*

- *Liquidation value of customer loans: ψ_i*

- *Size of the shock: $L_i - \psi_i$*

Assumption 1 *(Myopic Expectations) After bank D offers the loan to one of the other three banks it does not expect any further changes in any of the balance sheets.*

Assumprion 2 *(Catastrophic Fire Sales) Any subsequent balance sheet shocks completely wipe out the value of customer loans on the bank's balance sheet.*

Assumption 3 *(Proportional Shocks) The probability that any of the banks A or B or C goes to insolvency is equal to $\frac{1}{3}$. Shocks are proportional to the value of the inflicted bank's customer loans.*

Assumption 4 *(Identical Shocks)* $L_i - \psi_i = L_j - \psi_j \leqslant 1$, for every bank i or j. *The probability that a bank goes to insolvency is proportional to the value of its customer loans.*

Main Results

1. The structure of the network (profit maximizing choice) is not independent of the policy choice.

2. Proportional Shocks:

   (a) Under depositor seniority, for any values of z and ψ, it is never optimal for bank D to offer the loan to bank B.

   (b) Under bank seniority, for any values of z and ψ, offering the loan to bank B is the dominant choice.

   (c) Offering the loan to bank B maximizes welfare for any values of z and ψ except the worst case scenario of very high initial losses and very low profitability.

3. Identical Shocks:

   (a) Under depositor seniority the choice of bank D would depend on the distribution of shocks.

   (b) Under bank seniority bank D will be indifferent across the three choices.

   (c) Expected welfare is maximized by offering the loan either to bank A or bank B.

Conclusion

Overall bank seniority which provides incentives to bank D to offer the loan to bank B would also maximize expected social welfare.

The only exception would be if the joint likelihood of (a) *extreme high initial losses*, (b) *catastrophic fire sales*, (c) *low profitability*, and (d) *lack of asset diversification*, is very high.

These four conditions provide a fair characterization of the status of the US banking system around the 2008 financial crisis.

Offering the loan to bank B raises the connectivity of the system and reduces the resilience of the system to large shocks.