Discussion of

Leverage and Risk in US commercial banking in the light of the current crisis

by

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April 28, 2010

Selective Summary of Results

- Everybody knows that leverage is the culprit for all evil. But is it?
- Relevant study, tedious data collection.
- Some aspects of leverage are statistically and economically significant, while others that would have been expected to be, were not.
- Especially noteworthy is the insignificance of broad leverage measures (in particular LEV1=A/E) on Z.
- More of an effect on TOTRISK, which is a bit less surprising, but useful to know, especially the effect of the composition of leverage.

On Z

- Consolidate all banks into one: with $r_i := \frac{\pi_i}{A_i} \sim (\mu_i, \sigma_i)$, get $\pi := \sum_i \pi_i$, $A := \sum_i A_i$, and so

$$r = \frac{\pi}{A} = \sum_i \left(\frac{A_i}{A}\right) \frac{\pi_i}{A_i}$$

and

$$\mu := \sum_i \left(\frac{A_i}{A}\right) \mu_i, \quad \sigma := \text{std}\left(\frac{\pi}{A}\right)$$

- This way of consolidating has material consequences. Also, σ embeds the copula.

- Then define

$$Z := \frac{\mu + \frac{E}{A}}{\sigma}$$

- Now

$$\mathbb{P}(E \leq -\pi) = \mathbb{P}(\text{consolidated bank insolvency}) = \mathbb{P}\left(r \leq -\frac{E}{A}\right)$$
$$= \mathbb{P}\left(\frac{r-\mu}{\sigma} \leq -Z\right) := F_r(-Z)$$

- A larger Z reduces, ceteris paribus, the probability that the consolidated bank is insolvent.

- But the prob of insolvency $\mathbb{P}(E \leq -\pi) = F_r(-Z)$ depends both on Z and on the distribution F_r!

- **Fact ("How to Game the System").** Given (μ, σ) and given Z, the banking sector can shift more mass into the left tail while keeping the risk measure, the capitalisation level and the moments unaffected.

- This is related to Goodhart's Law, should supervisors create policies in terms of Z.

- But the Z measure has redeeming qualities: while I can game it, I can only game it up to a point, and that point itself depends on Z: by Chebyshev's inequality,

$$\mathbb{P}\left(r \leq -\frac{E}{A}\right) \leq \frac{1}{Z^2}, \qquad \text{for any probability measure } \mathbb{P}$$

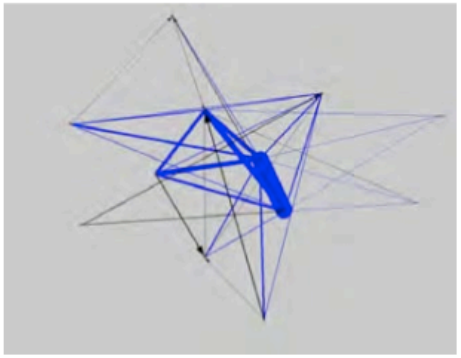
On Consolidation and Networks

- Banks are not only too large to fail, they can be too interconnected to fail. Systemic risk depends not only on the extent of bad shocks, it also depends on the way the network is structured (which by itself is a choice).

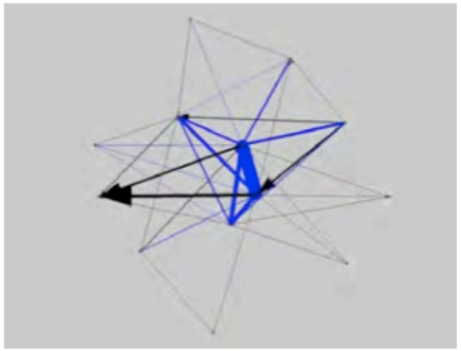
- Consolidation corresponds to a completely connected graph with full securitization. But is the real life network completely connected?

- **Examples**: Sterling unsecured market (Wetherilt, Zimmerman and Soramäki, "The sterling unsecured loan market during 2006-2008: insights from network topology," 2009), the UK interbank market (Prasanna Gai and Sujit Kapadia, "Liquidity Hoarding, Network Externalities and Interbank Market Collapse," 2010), the CDS market (Markose et al, "Too Interconneced to Fail: Financial Contagion and Systemic Risk From Network Model of CDS and Banks," 2009).

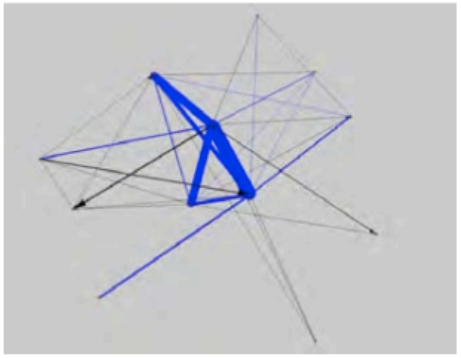
(3) 4 October 2007



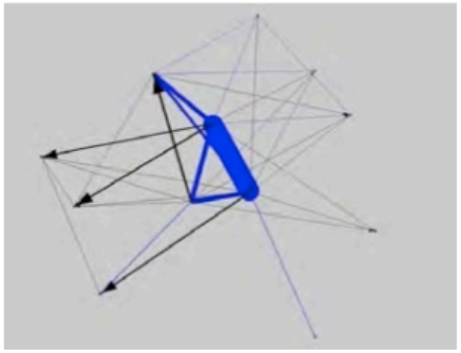
(4) 15 September 2008



(5) 8 October 2008



(6) 16 December 2008



Key

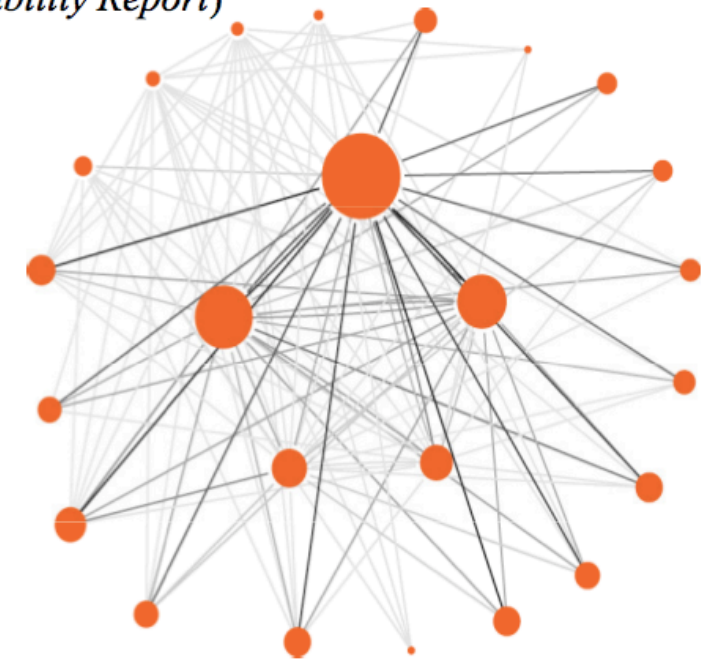
Reciprocated link

Loan (arrow points to borrower)

Bank

The UK Interbank Market, 2008 Q1

Network of large exposures[a] between UK banks[b][c] (from June 2009 Bank of England *Financial Stability Report*)



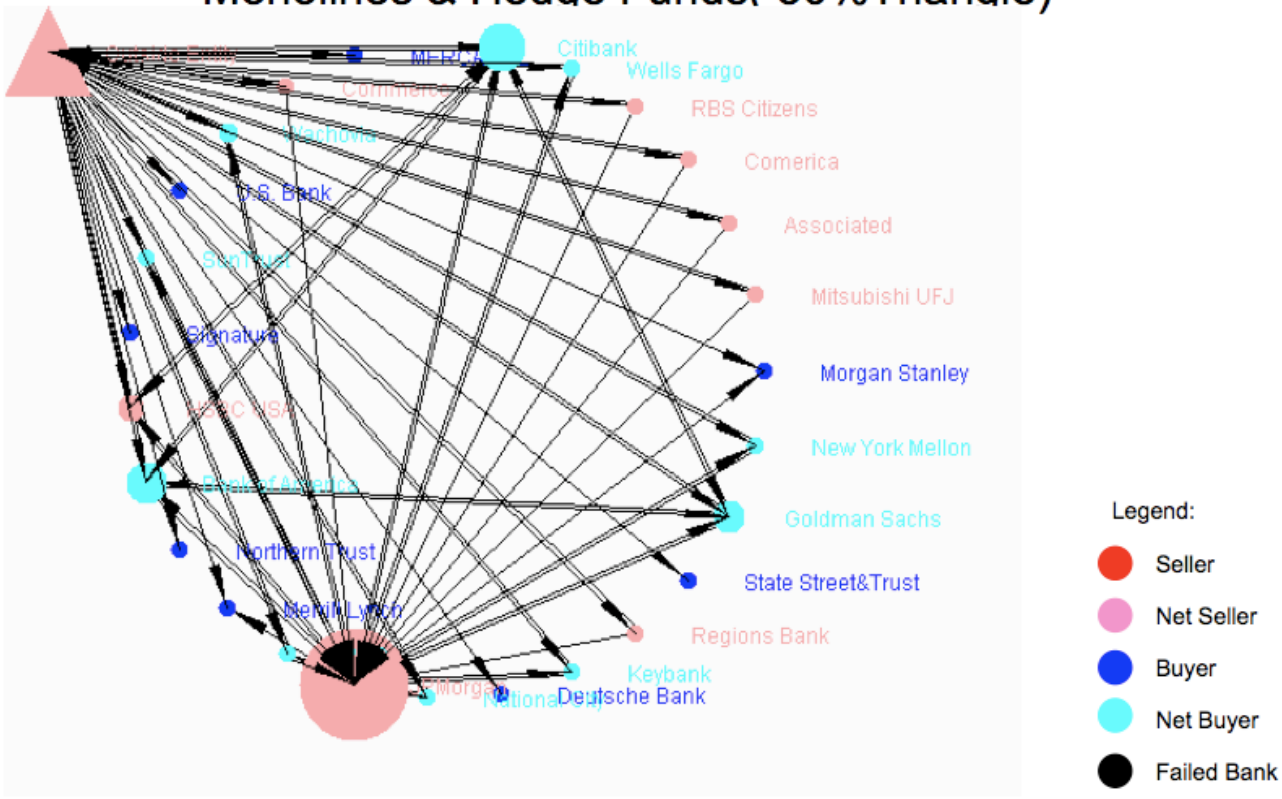
Source: FSA returns.

(a) A large exposure is one that exceeds 10% of a lending bank's eligible capital during a period. Eligible capital is defined as Tier 1 plus Tier 2 capital, minus regulatory deductions.

(b) Each node represents a bank in the United Kingdom. The size of each node is scaled in proportion to the sum of (1) the total value of exposures to a bank, and (2) the total value of exposures of the bank to others in the network. The thickness of a line is proportionate to the value of a single bilateral exposure.

(c) Based on 2008 Q1 data.

Initial CDS Financial Network for 25 US Banks (2008 Q4): Note Majority of Interconnections are among top 4 banks and Monolines & Hedge Funds(30%Triangle)



Source: ACE Stress Testing

Allen and Gale

- Allen and Gale in their 2000 JPE paper show that complete market structures as well as disconnected ones are less prone to systemic default as the intermediate one of a wheel. This suggests that a Z based on consolidation may underreport systemic risk.

FINANCIAL CONTAGION

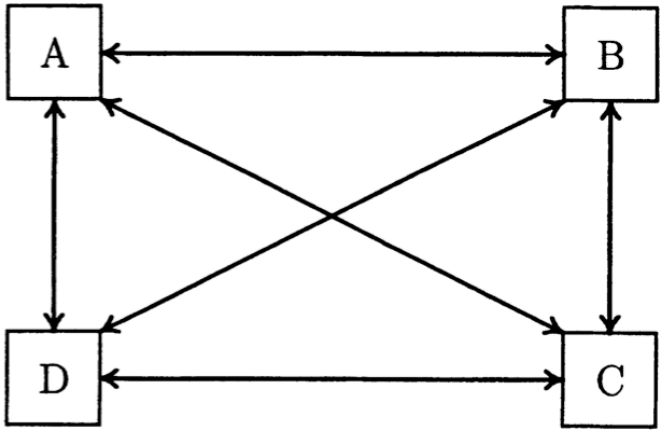


FIG. 1.—Complete market structure

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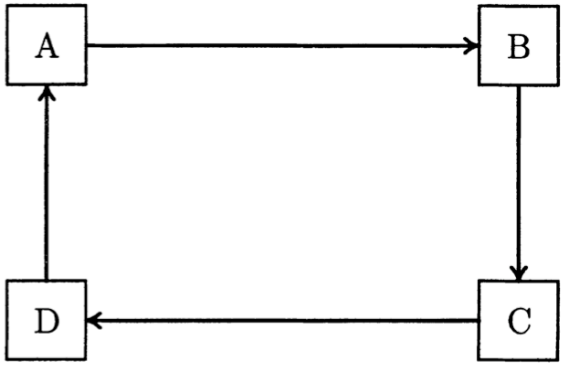

FIG. 2.—Incomplete market structure

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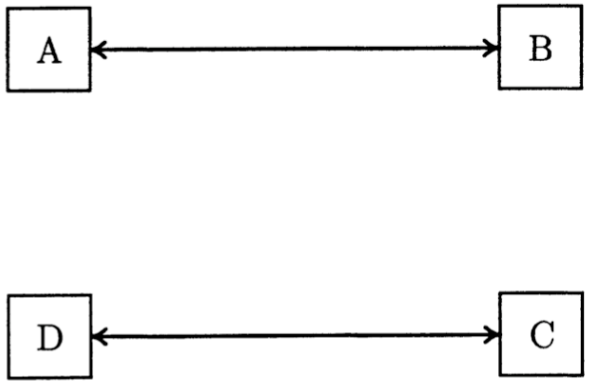

FIG. 3.—Disconnected incomplete market structure

Cabrales, Gottardi and Vega Redondo

- Networks form through mutualisation (through securitisation). Shocks can be fat tailed.

- The authors show, amongst others, that in their case the opposite may be true.

- **Summary Proposition.** A completely connected structure better insulates against not too bad shocks, but does lead to total destruction if the perfect storm hits, while in less connected structures some banks survive.

Endogeneity

- Another promising extension is to estimate the full system. Here the authors study:

$$\text{leverage and controls} \Rightarrow \text{risk measures}$$

- But leverage is not an exogenous variable, and neither are some of the controls such as the extent of short term assets etc.

- Leverage is chosen, and at least for broker dealers, chosen in a pro-cyclical fashion (Adrian and Shin). It follows that if the bank CRO estimates that his view is that risk is under control, he will gear the bank up. So

$$\text{risk measures and controls} \Rightarrow \text{leverage}$$

Nonlinearities

- It is quite conceivable that systemic events unfold non-linearly.
- Which is why splitting the data set makes sense.
- But since markets go up by the escalator and down by the elevator, nonlinearities probably matter quite a bit, especially in a crisis with delevering and feedback effects acting as amplification mechanisms.
- Also, in view of Chebyshev's inequality, how about trying $\frac{1}{Z_t}$ or even $\frac{1}{Z_t^2}$ as regressants?

Merci fiir mer no ze lauschteren!