Credit Insurance, Bailout & Systemic Risk

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CAFRAL & World Bank Conference, 2020

February 26, 2020

Motivation

- Banks made large investments in real estate and hedged their investments using CDS contracts
- AIG issued CDS on large scale ($533 bn. as of Dec 2007)
- AIG made large investments in real estate ($85 bn. as of Dec 2007) $\Rightarrow$ lack of diversification
- Systemically important firm $\Rightarrow$ AIG Bailout- $182 bn.
- Counterparty banks got the benefit of bailout

Counterparty	Funds transfered ($ bn.)
Goldman Sachs	12.9
Societe Genrale	11.9
Deutche Bank	11.8
Barclays	8.5

Questions

- What is the impact of expectation of bailout on investment strategy of counterparty banks?
- Why did AIG underprice credit risk?
- Why did AIG invest in real estate, the very sector it was insuring?

Summary of model and results

- Banks invest and choose the correlation of their investments
- Write CDS contracts with a competitive firm

Results:

- Banks make correlated investments (systemic risk)
- Insure for the good aggregate state and rely on bailout in bad aggregate state (underpriced contracts)
- Insurance firm invests in same sector as banks

Policy implications:

- Cap on the size of insurance firm prevents systemic risk
- Central clearing counterparty may help in creating systemic risk

Intuition for results

Why correlated investments and underpriced contracts?

- Regulator bails out the insurance firm to save the banks
- Crisis resolution policy is **imperfectly targeted** $\Rightarrow$ Banks want their assets to fail *exactly* at the time of bailout $\Rightarrow$ Correlated investments
- Reduces the cost of insurance *ex-ante*

Why insurance firm invests in same sector?

- Maximize the likelihood that its assets perform well when banks are also performing well

Comparison with Acharya & Yorulmazer (2007a,b)

Too many to fail problem. Regulator has two policy options

1. Imperfectly targeted policy: Bailout banks $\Rightarrow$ Correlated investments *ex ante*
2. Targeted policy: Provide liquidity to successful banks to buy failed banks$\Rightarrow$ Uncorrelated investments

My paper: Bailout insurance firm

- Explains why targeted policy cannot be used. The insurance firm creates a wedge between the banks and regulator. Targeted policy cannot be used as failure of insurer results in failure of all banks.

Literature review

Systemic risk

- Farhi & Tirole (2011), Acharya & Yorulmazer (2007a,b, 2008), Acharya (2009), Allen & Carletti (2006)

Too big to fail and bailouts

- Stern & Feldman (2004), Strahan (2013), Kelly et al. (2016), Veronesi & Zingales (2010)

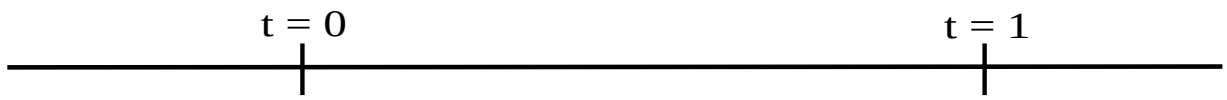
Counterpary risk

- Thompson (2010), Acharya & Bisin (2014), Biais et al. (2016)

Outline

1. **Model**
2. Model solution
3. Policy implications
4. Extension

Model



Banks borrow and invest in an industry

Choose correlation of their assets with other banks

Write CDS contract with competitive firm

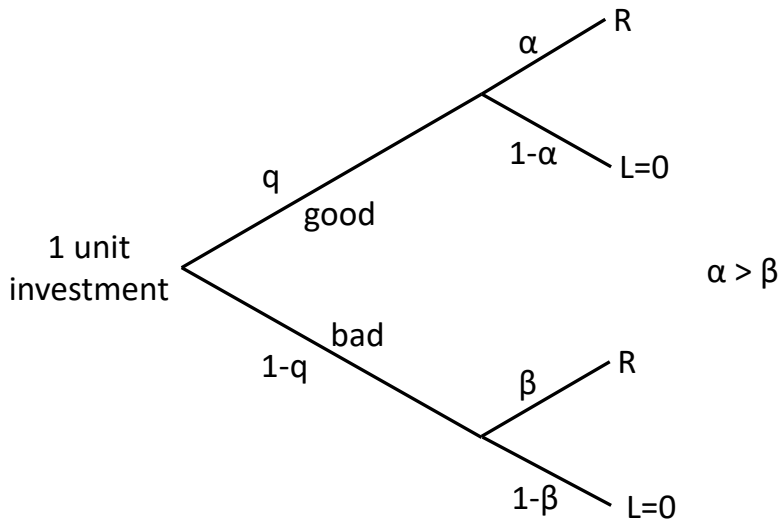
Return R or L is realized

If successful, they continue to operate (Continuation value V)

Insurance firm: Bailed out or not

- Banks (continuum) borrow from depositors (no insurance) and invest. Return $R > 1$ or $L = 0$
- If successful: Continuation value V

Risky investment



- Banks make a loan in an industry. Industry is in good state or bad state.
- If banks invest is same industry ($\rho = 1$) - Two aggregate states (good and bad)
- If banks invest in different industries ($\rho = 0$), one aggregate state
  - $\omega = q\alpha + (1-q)\beta$ receive R

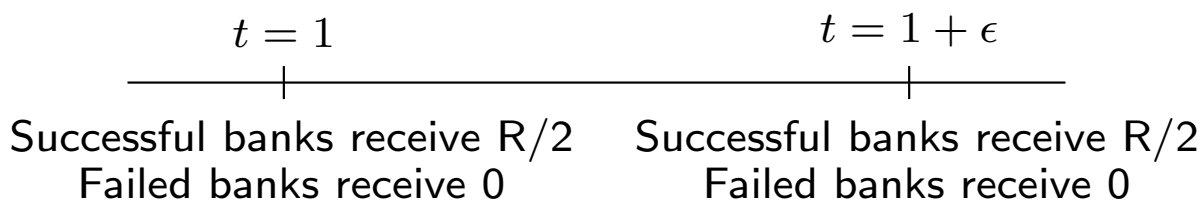
Asset maturity and deposit contract

Benchmark case: Assets of a bank mature together at $t = 1$

- No possibility of run on solvent banks

Realistic case: Assets do not mature together

- $\gamma = \frac{1}{2}$ of assets mature at $t = 1 + \epsilon$
- Possibility of run on solvent banks



Deposit contract: Face value D. Contract matures at $t = 1$ for both cases.

Insurance contract

- Insurance firms in Bertrand competition
- Banks collectively write contract with one firm
- Premium z
- Insurance firms stores the premium (benchmark)

Equilibrium

Equilibrium definition: Correlation (ρ), face value of deposits (D), premium (z) such that

- Banks choose ρ, D and z to maximize profits
- Expected profit of depositors $= 0$
- Expected profit of insurance firm ≥ 0

Solution in two steps:

- Step 1: Solve for D, z for given ρ
- Step 2: Solve for optimal ρ

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Analyze 4 scenarios

Mature together, $\rho = 0$	Not together, $\rho = 0$
Mature together, $\rho = 1$	Not together, $\rho = 1$

Ex post analysis: Assets mature together, $\rho = 0$

- Without insurance: $1 - \omega$ banks fail and loose continuation value
- Regulator intervenes: Sells failed banks to successful ones
  - Profit transfer to regulator

Proposition: Banks write fairly priced insurance contract with $z = (1 - \omega)R$. Expected profit equals

$$\underbrace{\omega R - 1}_{NPV} + V.$$

$\rho = 0$, Assets do not mature together

What happens without insurance?

- Depositors do not observe returns $\Rightarrow$ Run on banks
- Asset maturing at $t = 1 + \epsilon$ is sold to outside investors at price ωR
- Successful banks can raise $R/2 + \omega R/2$
- Assumption: $R/2 + \omega R/2 > 1$ i.e. successful banks do not go bankrupt
- Failed banks sold to successful banks. Transfer to regulator.
- No Bailout

Optimal insurance contract

Proposition: Banks write fairly priced insurance contract with premium $z = (1 - \omega)R$. Expected profit $= \omega R - 1 + V$.

Why not write underpriced contract?

- No bailout of insurance firm
- Regulator will let the insurance firm fail and sell the failed banks to successful banks

$\rho = 1$, Assets do not mature together

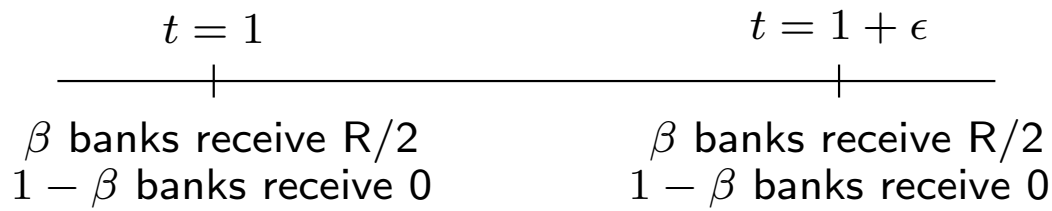
Banks invest in same industry

- Two aggregate states: Good and Bad
  - Good state: α banks succeed
  - Bad state: β banks succeed
- $\alpha > \beta$

Result: Banks will insure only for good state with premium $= (1 - \alpha)R$. Rely on bailout in bad state.

$\rho = 1$, Assets do not mature together

What happens in bad state with premium $(1-\alpha)R$?



- Insurance company owes $R/2$ to each of $1-\beta$ banks
- Assumption: Insurer announces bankruptcy at $t = 1$

$$\underbrace{(1-\alpha)R}_{premium} < \underbrace{(1-\beta)R/2}_{obligation}$$

- Failed banks are insolvent $\Rightarrow$ Run on all banks

Systemic failure in bad state

- Banks can sell assets to outside investors at price βR
- Successful banks can raise $R/2 + \beta R/2$
- Assumption: $R/2 + \beta R/2 < 1 + \underbrace{(1-\alpha)R}_{premium}$. Successful banks also go bankrupt
- Assumption: Regulator cannot observe returns $\Rightarrow$ cannot act as LOLR for solvent banks
- **Result**: Regulator bails out insurance firm to prevent all counterparty banks from failing

Equilibrium contract

Proposition

The equilibrium premium is $(1-\alpha)R$. Banks are insured for the good state and rely on bailout in bad state. Risk is underpriced. Expected profit of banks is

$$\alpha R - 1 + V.$$

- No bailout in the good state, so premium only prices the good state
- Net expected transfer from the regulator $= (1-q)(\alpha-\beta)R$

Main Result

Theorem: When assets do not mature together, *ex ante* banks prefer to make correlated investment.

Intuition

- Imperfectly targeted policy implies banks want their assets to fail together *exactly* at the time of bailout

$\rho = 1$, Assets mature together

Theorem: When assets mature together, $\rho = 1$ cannot be an equilibrium.

Intuition:

- Suppose $\rho = 1$
- If banks insure for good state ($z = (1 - \alpha)R$): Regulator will sell the failed banks to successful banks in bad state $\Rightarrow$ **Profit transfer to regulator**
- If banks insure for bad state ($z = (1 - \beta)R$): In good state **profit transfer to insurer**
- Hence a bank prefers to deviate *ex ante* and invest in a different industry and write fairly priced contract

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Size cap on insurance firm

Proposition: Banks make uncorrelated investments.

Intuition

- Suppose banks make correlated investments and write underpriced contracts
- Size cap $\Rightarrow$ Many insurance firms
- In bad state regulator bails out some insurance firm and not others
- Counterparty banks of bailed out firms survive. Others fail.
- Sell the failed banks to surviving banks. Regulator is able to extract some surplus or banks may be sold at fire sale price.
- Result: Banks find it profitable to deviate *ex ante* and invest in different industry

Central clearing counterparty

- CCPs may help create the crisis
- Over the counter markets are opaque
- CCPs more transparent: Help banks coordinate in writing insurance contract with the same insurer

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Extension: Insurance firm can invest in an industry

- Suppose banks make correlated investments
- Will insurance firm invest in same or different industry?

Two aggregate states:

- Bad state results in bailout $\Rightarrow$ Insurance firm earns no profit
- Good state: No bailout
  - Insurance firm's return can be R or L (assume > 0)
  - Insurance contract s.t. banks are insured even if return is L

$$zL = (1 - \alpha)R$$

  - So, insurer earns positive profit when its return is R
- **Result:** Insurer maximizes the probability of return R when the banks are in good state $\Rightarrow$ Invest in the same industry

Conclusion

- Identify a new channel for systemic risk taking
- Explain why credit insurance may be underpriced
- Explain why insurance firms may not diversify
- Policy implications: Cap on size