Counterparty Risk in Financial Contracts: Should the Insured Worry about the Insurer?

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What is Counterparty Risk?

Risk that when an insured party makes a claim, the insurer is insolvent.

Questions

- What are the effects of counterparty risk on insurance contracts?
- Given that an insurer can fail, how do they behave? What are their investment objectives?

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- Financial markets have very large insurance contracts
  - Market for Credit Derivatives.
- Consider who the counterparties are:
  - Banks
  - Hedge Funds
  - Insurance Companies

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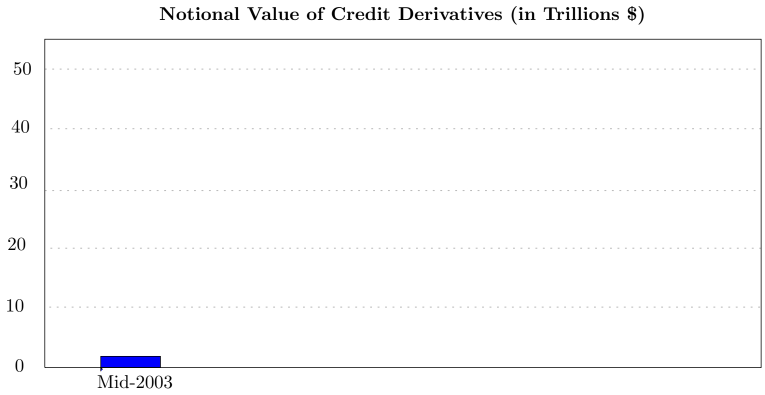
"Credit risk, and in particular, counterparty credit risk, is probably the single most important variable in determining whether and with what speed financial disturbances become financial shocks with potential systemic traits"

- Towards Greater Financial Stability. The report of the Counterparty Credit Risk Management Group (CRMPG II), ISDA, 2005.

"Over the weekend, ACA, a small bond insurer, has been in frantic talks to avoid insolvency...
ACA sold banks a kind of insurance against losses on risky debt. If it collapses, this insurance will be rendered worthless, and every other bank that had dealt with it will suffer losses."

- Counterparty risk fears re-enter mainstream.
Financial Times, Mon., Jan. 21, 2008.

Growth in Credit Derivatives



Source: ISDA 2005,2007

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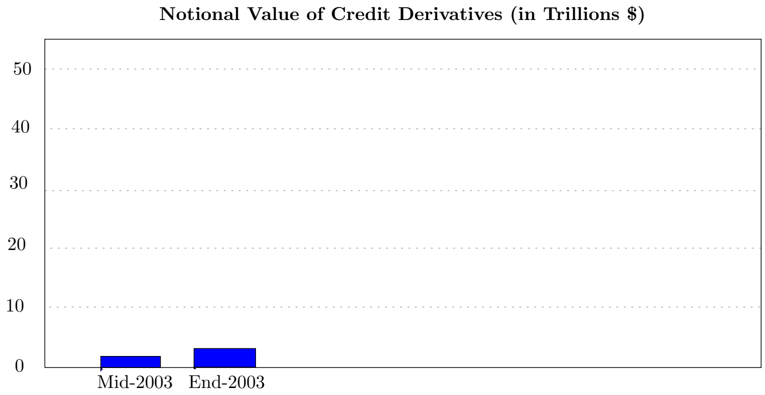

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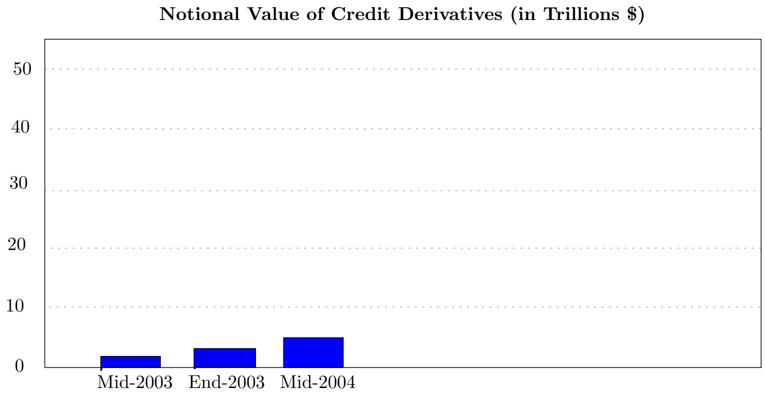

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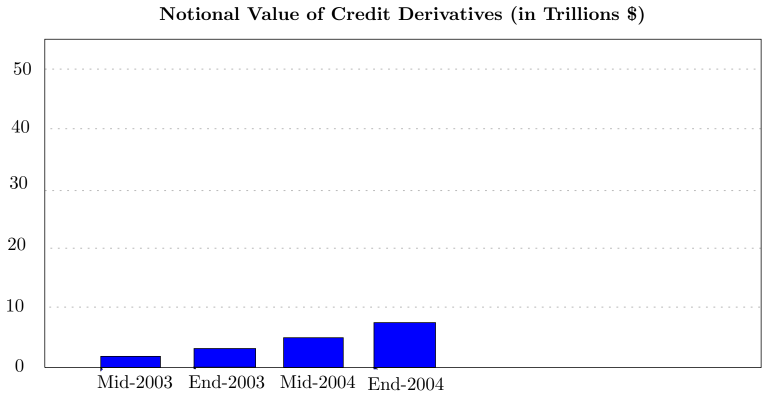

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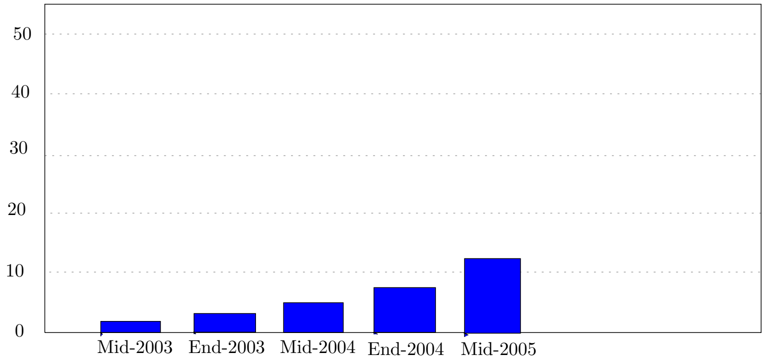
Growth in Credit Derivatives

Notional Value of Credit Derivatives (in Trillions $)



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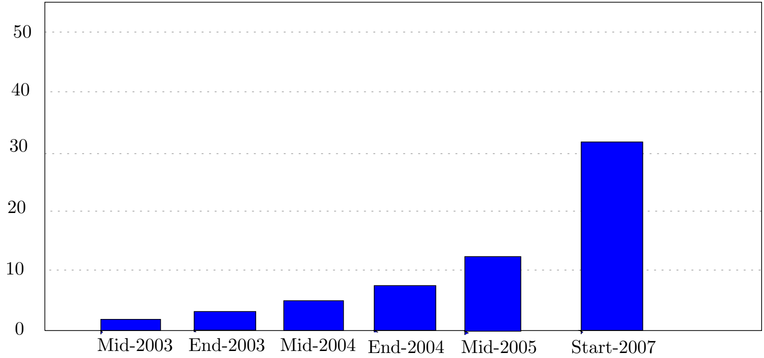

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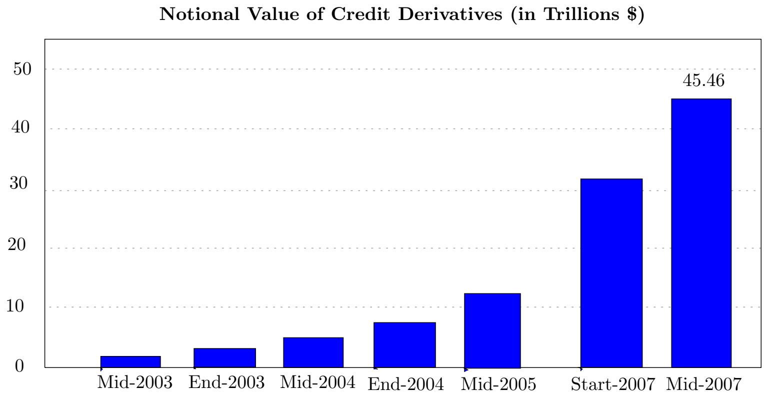

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Main Results

- I uncover a new moral hazard problem on insurer side.
  - To answer my title: YES.
- Compare to Akerlof (1970): Moral hazard problem can alleviate adverse selection problem!
- Applicable to correlated aggregate risk (e.g. The current market turbulence...)

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Players

- Insured Party (Bank)
  - Endowed with Risky or Safe loan (equal prob.)
  - Insure a fixed amount of its loan with insurer
- Insurer (IFI)
  - Endowed with a portfolio that can be sold off (costly) at interim stage
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- Return R_B with probability:
  - Safe: p_s
  - Risky: p_r

- Insures proportion (γ) of loan. Suffer cost Z if no protection.

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Model Setup - Insurer (IFI)

- Portfolio (realized at $t = 2$)

$$\int_0^{\overline{R}_f} \theta f(\theta) d\theta + \int_{\underline{R}_f}^0 (\theta - G) f(\theta) d\theta$$

- Portfolio can be accessed at $t = 1$, however, cost of liquidation $C(\cdot)$ with $C' > 0$, $C'' \geq 0$.

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Information and Beliefs

- Only Bank knows loan quality
- Define b as IFIs expectation of the probability of claim.
- IFI investment choice for premia: liquid (storage - return 1), illiquid (return $R_I > 1$)
- If claim made, only liquid asset available
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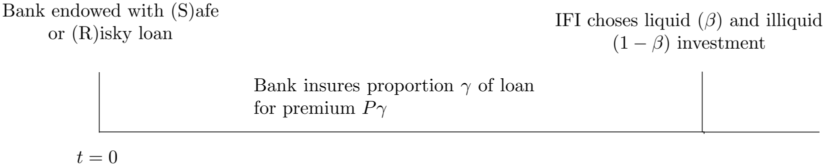
Timing


Bank endowed with (S)afe
or (R)isky loan
IFI choses liquid (β) and illiquid
($1 - \beta$) investment
Bank insures proportion γ of loan
for premium $P\gamma$
$t = 0$

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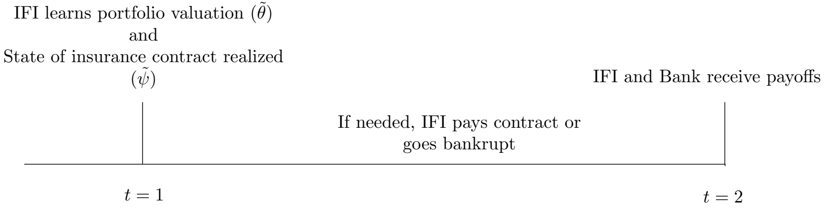
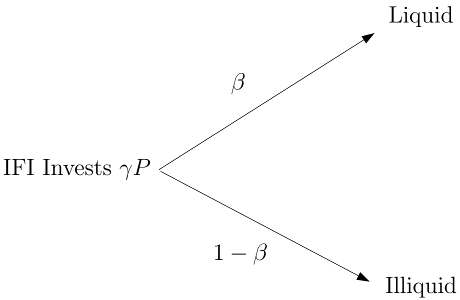

IFI learns portfolio valuation ($\tilde{\theta}$)
and
State of insurance contract realized
($\tilde{\psi}$)
IFI and Bank receive payoffs
If needed, IFI pays contract or
goes bankrupt
$t = 1$
$t = 2$


Liquid
β
IFI Invests γP
$1-\beta$
Illiquid

IFI's payoff - No Insurance

$$\Pi_{IFI}^{NI} = \underbrace{\int_0^{\overline{R}_f} \theta f(\theta) d\theta}_{\text{IFI succeeds}} + \underbrace{\int_{\underline{R}_f}^{0} (\theta - G) f(\theta) d\theta}_{\text{IFI fails}}$$

IFI's payoff - With insurance contract

- IFI maximizes (expected) profit for a fixed b and P choosing β.

IFI's payoff - With insurance contract

$$
\begin{aligned}
\max_{\beta} \; \Pi^{I}_{IFI} \;=\; & P\gamma(\beta + (1-\beta)R_I) \\
& + (1-b)\left[\int_{-P\gamma(\beta+(1-\beta)R_I)}^{\overline{R}_f} \theta f(\theta) d\theta \right. \\
& \left. + \int_{\underline{R}_f}^{-P\gamma(\beta+(1-\beta)R_I)} (\theta - G) f(\theta) d\theta \right] \\
& + (b)\left[\int_{C(\gamma-\beta P\gamma)}^{\overline{R}_f} (\theta - C(\gamma - \beta P\gamma) - \beta P\gamma) f(\theta) d\theta \right. \\
& \left. + \int_{\underline{R}_f}^{C(\gamma-\beta P\gamma)} (\theta - G) f(\theta) d\theta \right]
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Result and Assumptions

Proposition

The amount put in the liquid asset (β) is increasing in the belief of the probability of a claim (b)

- Assume $F(\theta)$ uniform.

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Market Clearing Price

- Assume Bertrand Competition for IFIs.
  $\Rightarrow \Pi_{IFI}^{NI} - \Pi_{IFI}^{I}(\beta^*) = 0.$

Lemma

The market clearing price is unique and in the open set $(0, 1)$

Intuition. If $P = 0$, IFI can never make zero profit. If $P \geq 1$, IFI sets $\beta = 1$ and makes positive profit.

Lemma

The riskier the loan is perceived to be, the higher the insurance premium that must be paid.

Intuition. If claim more likely to be made, IFI needs to be compensated for extra loses to break even.

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Bank Incentives

- Define $\beta^*_S \equiv \beta^*_{b=S}$, β^*_R, P^*_S, P^*_R.
- Message $\mathcal{M} \in \{S, R\}$
- Bank Payoff: $\Pi(i, \mathcal{M})$ where $i \in \{S, R\}$

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Equilibrium

Definition

An Equilibrium is defined as a β, P, b such that:

1. b is consistent with Bayes' rule where possible.
2. Choosing P, the IFI earns zero profit with β derived according to the IFI's problem.
3. The bank chooses its message optimally

Beliefs

Proposition

If the IFI believes a claim is less likely to be made than it actually is, the banks counterparty risk rises whenever $\beta \in (0,1]$.

Intuition. The IFI will chose more illiquid investment thereby raising the probability they fail if a claim is made.

- Use beliefs that correspond to separating equilibrium.
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Payoff to Risky Bank Reporting Safe

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Risky prefers to report Risky

$$\Pi(R,R) \geq \Pi(R,S) \Rightarrow$$

$$\underbrace{(1+Z)\,(1-p_R)\int_{C(\gamma-\beta_R^* P_R^* \gamma)}^{C(\gamma-\beta_S^* P_S^* \gamma)} dF(\theta)}_{\text{expected saving in counterparty risk}} \geq \underbrace{P_R^* - P_S^*}_{\text{amount extra to be paid in insurance premia}}$$

"Counterparty Risk Effect Dominates"

Safe prefers to report Safe

$$\Pi(S,S) \geq \Pi(S,R) \Rightarrow$$

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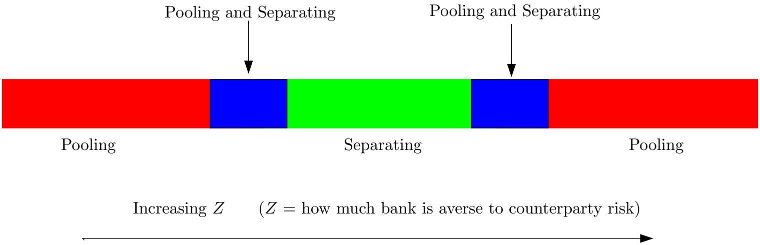
"Premium Effect Dominates"

Overview of Equilibria



Contract Inefficiency - The Moral Hazard

- Contracting imperfection: Bank cannot control investment of IFI
- Fix IFI at any belief and maintain zero profit condition on the IFI
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Any equilibrium in which $\beta^* \in [0, 1)$ is inefficient.

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Raise β until the marginal cost (increased premium) equals marginal benefit (decreased counterparty risk).

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Extensions

1. Multiple Insured Parties (Banks)
2. Moral Hazard in Bank-Borrower Relationship

Extension 1: Multiple Banks

- Consider one insurer and many banks
- Each bank is insignificant to the insurer's decision.
- Let there be a measure $M < 1$ banks
- Each bank is given a type (probability of default - X) according to a uniform draw

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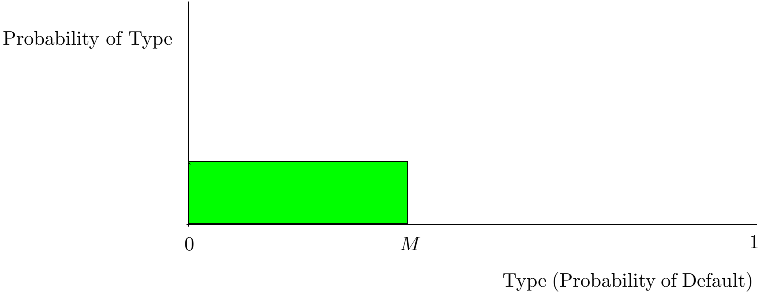
Probability of Type
0
M
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Type (Probability of Default)

- All banks receive a private aggregate shock:

$$p_A = \begin{cases} r & \text{with probability } \frac{1}{2} \\ s & \text{with probability } \frac{1}{2} \end{cases}$$

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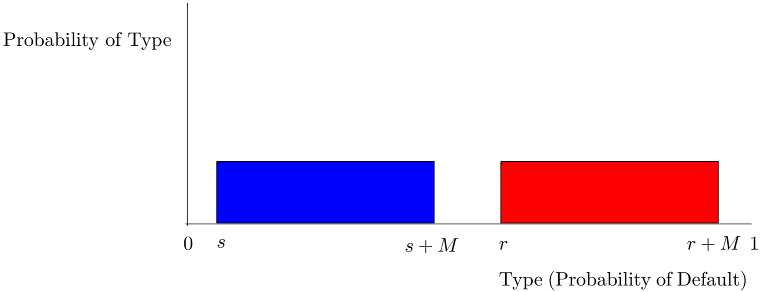
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All wish to be revealed as receiving $X_i = 0$.

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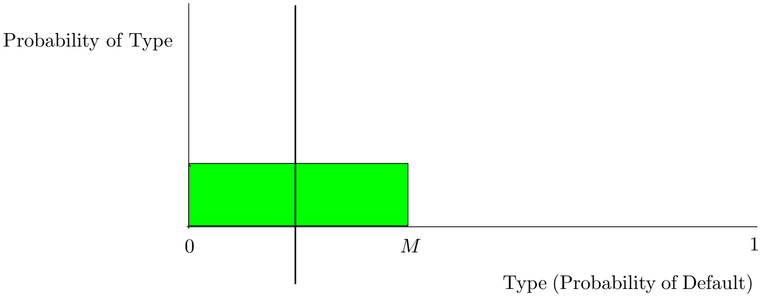
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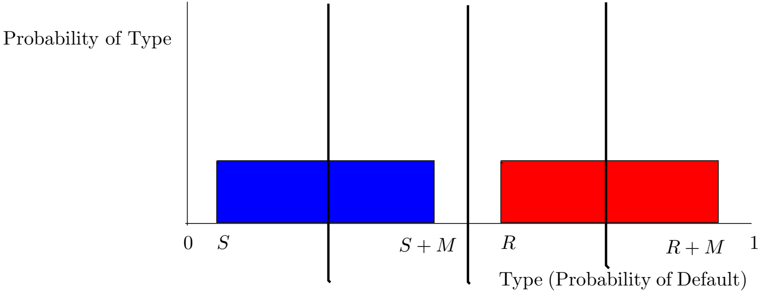
Probability of Type
0
S
S + M
R
R + M
1
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Extension 2: Classical Moral Hazard Problem

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Insurance, No Counterparty Risk

- Desire to monitor decreases

Insurance with Counterparty Risk

Double Moral Hazard problem

- RESULT: Can show that desire to monitor can increase from no counterparty risk case
- RESULT: Adding this moral hazard problem doesn't change qualitative results

Insurance with Counterparty Risk

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- Modelled the incentive and informational effects of counterparty risk
- A moral hazard problem can be present on the insurer side of market
- The new moral hazard can alleviate the adverse selection problem
- Contract size needn't be large
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