Should Derivatives be Privileged in Bankruptcy?

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Background

Derivatives enjoy **super-seniority in bankruptcy:**

- not subject to automatic stay
- netting, collateral, and closeout rights
- can keep eve-of-bankruptcy payments

$\Rightarrow$ **To the extent that net exposure is collateralized, derivative counterparties get paid before anyone else...**

But why should/shouldn't derivatives be senior?

- systemic risk (Edwards and Morrison 2005; Bliss and Kaufman 2006)
- monitoring incentives for creditors (Roe 2010)
- cost of hedging

Why We Should be Interested

- Role of derivatives in demise of Lehman

  "This caused a massive destruction of value."

  Harvey Miller (2009)

- Discussion of amending bankruptcy treatment of derivatives around Dodd-Frank

- Ex-ante distortions through senior derivatives

  "It's plausible to wonder whether Bear's financing counterparties would have so heavily supported Bear's short-term repo financings were they unable to enjoy the Code's advantages."

  Mark Roe (2010)

This Paper: A Simple Model of Derivatives and Seniority

Central insights:

Derivatives serve a valuable role as risk management tools, **BUT**

1. senior derivatives may **raise** overall cost of hedging
2. seniority for derivatives may lead to **excessively large derivative positions/markets**
3. seniority for derivatives may induce **speculation rather than hedging**

Why? Seniority for derivatives dilutes existing debtholders

- Increases cost of debt $\Rightarrow$ firm has to take larger derivative position to hedge
- Firm may have an incentive to increase derivative exposure beyond efficient level/use derivative less suited for hedging

Related Literature

- **Law literature on seniority of derivatives:** Edwards and Morrison (2005), Bliss and Kaufman (2006), Roe (2010), Skeel and Jackson (2011)
- **Hedging:** Smith and Stulz (1985), Froot, Scharfstein and Stein (1993), Biais, Heider and Hoerova (2010)
- **Debt with limited commitment:** Bolton and Scharfstein (1990, 1996), Hart and Moore (1994, 1998)

The Model

Three periods: $t = 0, 1, 2$

Risk-neutral firm has investment project:

- investment at $t = 0$: F
- cash flows at $t = 1$: $\{C_1^H, C_1^L\}$ with prob $\{\theta, 1-\theta\}$
- cash flows at $t = 2$: C_2

Project can be liquidated at $t = 1$ for $L < C_2$

Liquidation value at $t = 2$ normalized to zero

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Debt Financing

Firm finances project using **debt**

- single risk-neutral creditor

Firm faces **limited commitment** à la Hart and Moore

- at $t = 1$ only minimum cash flow C_1^L verifiable
- borrower can divert $C_1^H - C_1^L$ at $t = 1$
- C_2 not pledgeable

Debt contract specifies **contractual repayment** R at $t = 1$

- if firm repays R, has right to continue and collect C_2
- otherwise creditor can liquidate firm

Cannot finance with risk-free debt: $C_1^L < F$

Benchmark: The Model without Derivatives

Two types of default:

- If $C_1 = C_1^L$ firm has no option but default
- If $C_1 = C_1^H$ firm repays if IC satisfied (R not too high)

$$C_1^H - R + C_2 \geq C_1^H - C_1^L$$

Which projects attract financing?

- Firm can finance project as long as: $F \leq C_1^L + \theta C_2$
- Social surplus: $\theta \left(C_1^H + C_2 \right) + (1 - \theta)\, C_1^L - F$

Limited commitment leads to inefficiency:

- early termination after C_1^L
- expected surplus loss of $(1 - \theta) C_2$

Introducing Derivatives

Derivative contract:

- specifies payoff contingent on realization of a *verifiable* random variable $Z \in \{Z^H, Z^L\}$
- Z is correlated with the firm's cash flow risk
- position chosen after debt is in place (and R has been set)

Interpretation of Z:

- asset price
- a financial index

Payoffs of derivative:

- protection seller pays notional X when $Z = Z^L$
- firm owes fair premium x when $Z = Z^H$

Using the Derivative to Hedge Cash Flow Risk

- Derivative pays off X with probability:

$$Pr[Z = Z^L] = 1 - p$$

- Usefulness in hedging determined by correlation to cash flow:

$$\Pr\left[Z = Z^L | C_1 = C_1^L\right] = \gamma$$

$\gamma = 1$ means that derivative is a perfect hedge (no basis risk)

- Counterparty to derivative (protection seller) incurs hedging cost

$$\rho(X) \qquad \rho'(X) > 0, \;\; \rho''(X) \geq 0$$

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$$\rho(X) = \delta X$$

Benchmark: No Basis Risk ($\gamma = 1$)

Can eliminate default after C_1^L by setting:

$$X = R - C_1^L \qquad R = F$$

Derivatives add value if and only if

$$\underbrace{(1-\theta)\,C_2}_{\text{reduction in default costs}} \quad - \rho\underbrace{\left(F - C_1^L\right)}_{\text{hedging cost}} > 0$$

Optimal derivative position just eliminates default:

$$X^* = R - C_1^L = F - C_1^L$$

Benchmark: No Basis Risk ($\gamma = 1$)

If firm **can commit** to derivative position taken ex-post:

- all surplus accrues to firm
- firm takes optimal derivative position $X = F - C_1^L$
- bankruptcy treatment irrelevant, since no default occurs

If firm **cannot commit** to derivative position taken ex-post:

- under senior derivatives harder to sustain hedging
- firm may take 'short' position in derivative
- channels funds form bad state to good state at expense of creditors

Equilibrium under Commitment: Senior Derivatives

To eliminate default, with probability $(1-\theta)\gamma$, need to set:

$$X = R - C_1^L$$

- R determined by creditor breakeven condition:

$$\left[\theta + (1-\theta)\,\gamma\right] R + (1-\theta)\,(1-\gamma)\left(C_1^L - x\right) = F$$

- x determined by derivative counterparty breakeven condition:

$$\theta x = (1-\theta)\,X + \delta X$$

Increase in surplus:

$$(1-\theta)\gamma C_2 - \delta X$$

Equilibrium under Commitment: Junior Derivatives

To eliminate default, with probability $(1-\theta)\gamma$, need to set:

$$X^S \quad = \quad R^S - C_1^L$$

- R^S determined by creditor breakeven condition:

$$\left[\theta + (1-\theta)\,\gamma\right] R^S + (1-\theta)\,(1-\gamma)\, C_1^L = F$$

- x^S determined by derivative counterparty breakeven condition:

$$\left[\theta - (1-\theta)\,(1-\gamma)\right] x^S = (1-\theta)\, X^S + \delta X^S$$

Increase in surplus:

$$(1-\theta)\gamma C_2 - \delta X^S$$

Key Point: Senior Derivatives Raise Cost of Debt

Face value of debt is lower when debt is senior:

$$\begin{aligned} R^S &\leq R \\ &\Leftrightarrow \\ R^S - C_1^L &\leq R - C_1^L \end{aligned}$$

- Required derivative position is smaller when debt senior
- This is more efficient because of deadweight cost of hedging δ

Difference in surplus:

$$\delta(R - R^S) = \delta \frac{(1-\gamma)(1-\theta)(1-\theta+\delta)}{[\theta+\gamma(1-\theta)][\theta-(1+\delta)(1-\gamma)(1-\theta)]} \geq 0$$

Partial Collateralization

Result extends to **partial collateralization**:

- $\overline{x} \leq x$ is collateralized and senior
- remaining claim of derivative counterparty is junior

Main point remains:
Surplus created by derivative contract decreasing in level of collateralization

Same intuition as before:

- $R(\overline{x})$ increasing in $\overline{x}$
- required derivative position increases in collateralization

Other Issues

Default due to derivative losses:

- overall payment $R(\overline{x}) + x(\overline{x})$ is increasing in $\overline{x}$
- more collateralization makes it less likely that firm can meet payment obligation in high state, where losses on derivative can cause default

Excessively large derivative positions:

- when derivative senior, firm may take excessively large derivative positions
- essentially speculating at expense of creditors
- No such incentive when derivatives are junior

Default due to Derivative Losses

Up to now have assumed firm repays when $C_1 = C_1^H$

BUT: Required payment $R(\overline{x}) + x(\overline{x})$ may cause default

- exceeds available cash C_1^H
- triggers strategic default

Firm meets payment obligations as long as

$$R\left(\overline{x}\right) + x\left(\overline{x}\right) \leq \min\left[C_1^H, C_1^L + C_2\right]$$

This is less likely to be satisfied when derivatives are collateralized:

$$\frac{\partial[R\left(\overline{x}\right) + x\left(\overline{x}\right)]}{\partial\overline{x}} = \frac{\delta\left(1-\gamma\right)\left(1-\theta\right)}{\left[\theta - \left(1-\gamma\right)\left(1-\theta\right)\right]\left[\theta + \gamma\left(1-\theta\right)\right]} > 0$$

Hedging or Speculation?

Up to now we assumed firm picks optimal derivative position $X = R - C_1^L$

But is this optimal once debt is in place?

- if firm cannot commit to derivative position at date 0, it may take a larger than optimal derivative position ex post

If hedging privately optimal ex-post, firm's optimal choice of derivative, once R has been set:

$$\max_{X^B \geq R - C_1^L} \theta \left[C_1^H - R + \frac{1-\theta}{\theta}(1-\gamma) X^B - \left[1 - \frac{1-\theta}{\theta}(1-\gamma)\right] x\left(X^B\right)\right] + (1-\theta)\gamma\left[C_1^L + X^B - R\right] + \left[\theta + (1-\theta)\gamma\right] C_2$$

Marginal Payoffs to Speculation

(a) Senior derivatives:

$$\underbrace{1-\theta}_{\text{marginal derivative payoff}} \quad - \underbrace{\left[1-\frac{1-\theta}{\theta}(1-\gamma)\right]}_{\leq 1} \underbrace{[1-\theta+\rho'(X)]}_{\text{marginal cost of derivative}} \quad \gtrless 0$$

- firm receives full benefit of derivative payoff
- firm does NOT bear full marginal cost
- creditor diluted, incentives to speculate

(b) Junior derivatives:

$$-\rho'(X) < 0$$

- no incentives to speculate

The Role of Basis Risk ($\gamma < 1$)

Incentives to **speculate** depend on basis risk:

- firm chooses optimal derivative position when $\gamma \geq \overline{\gamma}$
- firm takes excessive derivative position when $\gamma < \overline{\gamma}$

where

$$\overline{\gamma} = 1 - \frac{\delta\theta}{(1-\theta)(1-\theta+\delta)}$$

Under **linear hedging costs** δ, firm sets X^B to fully expropriate creditor in default state when $\gamma < \overline{\gamma}$:

$$X^B_{\gamma<\overline{\gamma}} = \frac{\theta}{1-\theta+\delta} C^L_1$$

Choice of Basis Risk ($\gamma < 1$)

After debt is in place, firm can choose derivative contract:

- derivatives differ in basis risk $\gamma \in [\gamma_{\text{min}}, \gamma_{\text{max}}]$

Firm's objective function is linear in γ:

- firm will follow a *bang-bang* strategy
- either minimum basis risk (γ_{max}) or maximum basis risk (γ_{min})

Minimum basis risk can be sustained as equilibrium if:

- Junior derivatives:

$$C_2 - \left[R^S(\gamma = \gamma_{\text{max}}) - C_1^L\right] \geq 0,$$

- Senior derivatives:

$$C_2 - \underbrace{\frac{1+\delta}{\theta}}_{\geq 1}\left[R(\gamma = \gamma_{\text{max}}) - C_1^L\right] \geq 0.$$

Discussion: The Size of Derivative Markets

Derivative markets may be inefficiently large

- status-quo of senior derivatives leads to ex-post dilution incentives
- firms may take on derivative positions that are inefficiently large
- even though derivative *per se* are value enhancing

Over the years, industry groups (e.g., ISDA) have lobbied for seniority

- seniority strengthened as part of Bankruptcy Act of 2005
- growth in derivatives markets since 2005

Industry may have an incentive to maximize size of derivative markets, not welfare

Discussion: Financial Firms

Automatic stay exemption for derivatives may have **particular bite for financial firms**

Exemption from automatic stay particularly hard to 'undo':

- costly to assign cash as collateral to all creditors/depositors ex-ante
- but then **hard to shield cash from derivative counterparties**
  - initial margins
  - margin calls
- once drained of cash, financial firm ceases to operate

See, e.g., Duffie (2010): Failure mechanics of dealer banks

Conclusion

Formal model of seniority for derivatives in simple, standard CF model

Findings:

- Derivatives are value-enhancing hedging tools

BUT

Super-seniority for derivatives:

- may **reduce surplus** by raising firm's cost of debt
- may lead to **excessively large derivative positions**
- may lead to **speculation rather than hedging**

Time to re-think special treatment of derivatives?