Should Derivatives be Senior?

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Background

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

- not subject to automatic stay
- netting, collateral, and closeout rights

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

But why should/shouldn't derivatives be senior?

Answers often vague:

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

Background (continued)

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 **raise** overall cost of hedging
2. seniority of derivatives may lead to excessively large derivatives positions/markets

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

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 $L = 0 < C_2$

Liquidation value at $t = 2$ normalized to zero

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

Benchmark: The Model without Derivatives

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

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
- 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 X when $Z = Z^L$
- firm pays fair premium x when $Z = Z^H$

Using the Derivative to Hedge Cash Flow Risk

- Derivative pays off X with probability:

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

- 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

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

Equilibrium: Senior Derivatives

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

$$X = R - C_L^1$$

- R determined by creditor breakeven condition:

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

- x determined by derivative counterparty breakeven condition:

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

Increase in surplus:

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

Equilibrium: Junior Derivatives

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

$$X^S = R^S - C_L^1$$

- R^S determined by creditor breakeven condition:

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

- x^S determined by derivative counterparty breakeven condition:

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

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:

$$R^S \leq R$$
$$\Leftrightarrow$$
$$R^S - C_1^L \leq R - C_1^L$$

- Required derivative position is lower 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 or collateralization

Same intuition as before:

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

Other Results

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

Conclusion

Model of seniority of derivatives in simple limited commitment CF model

Findings:

- Derivatives are a value-enhancing hedging tools

BUT

Super-seniority for derivatives:

- **reduces surplus** by raising firm's cost of debt
- may lead to **excessively large derivative positions**

Time to re-think special treatment of derivatives?