

# Corporate Hedging, Contract Rights, and Basis Risk

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# Overview

- Evidence that firms in distress hedge less:
  - Theoretical explanations are based on binding collateral constraints (Rampini and Vishwanathan, 2010; Rampini, Sufi, and Viswanathan, 2014), asset substitution (Jensen and Meckling, 1976) or firm inattention
- This paper: A standard OTC derivative contract can be terminated conditional on certain events of default. Questions we pursue:
  - When/why do counterparties terminate?
  - Show negative effect on intensity of hedging.
  - How does the option affect incentives to hedge ex ante?

## Background: ISDA Master Agreements

- OTC derivative contracts are governed by the ISDA Master Agreements
- The ISDA Master Agreement contains eight standard events of default, when the derivative position can be closed before maturity, plus additional events
  - failure to pay or deliver under the terms of the contract
  - breach of agreement
  - credit support default (e.g., a cessation of a financial guarantee)
  - misrepresentation
  - default under a specified transaction (e.g., a failure to pay under the securities lending agreement)
  - cross-default (e.g., default on a loan, breach of a covenant)
  - bankruptcy of the firm
  - merger without full assumption of liabilities
  - Common additional event: credit rating downgrade

## Examples

- “the interest rate swap transactions were terminated due to an event of default relating to the Company’s **non compliance with certain covenants**” *Sun Healthcare Group Inc.*
- “existing derivative contracts were involuntarily terminated **as a result of cross default provisions** between the Credit Facility and ISDA Master Agreements.” *Safety Kleen Corp*
- “certain of the Company’s derivative positions were terminated as a result of **defaults** under Sabine’s derivative agreements that occurred **prior to the filing of the Bankruptcy Petition.**” *Forest Oil Group*
- “the company has completely terminated its hedge portfolio and therefore is no longer party to any agreement whereby the counterparty financial institution can terminate a financial instrument **due solely to unfavorable changes in the company s credit ratings.**” *Baxter International Inc.*

## Model Assumptions $t = \{0, 1, 2\}$

- Firm has fixed liabilities,  $D_1$  and  $D_2$ , risky cash flows,  $C_1$  and  $C_2$ , and can enter into a derivative contract that pays at  $t = 2$
- At  $t = 1$ , the firm cash flow is  $C_1^H$  with probability  $1 - p_1$  or  $C_1^L$  with probability  $p_1$ .
- A hedging contract is signed at  $t = 0$  at fair value. Portfolio value  $V_t$  is imperfectly correlated with firm performance, i.e., there is basis risk.

$$P[V_1^H | C_1^H] = P[V_1^L | C_1^L] = \rho$$

$\rho > 1/2$  captures the fact that the derivative is a hedging asset.

## Model Assumptions:

- If cash flow  $C_1$  is low, **an event of default** is triggered whenever

$$C_1 - D_1 - V_1 < 0.$$

- The value of the derivative,  $V_1$ , is payable to the counterparty if the contract is terminated at  $t = 1$ .
- If the counterparty chooses not to terminate, the firm may recover,  $C_2 = C_2^H$ , or get further into distress,  $C_2 = C_2^L$ . The firm is liquidated if it receives another low cash flow and bad derivative outcome.
- The derivative portfolio value  $V_2 \in \{V_1 + \delta_H, V_1 + \delta_L\}$ ,

$$P(\delta_H | C_2^H) = P(\delta_L | C_2^L) = \rho$$

- Continuing the contract with the firm has benefits for the counterparty,  $\theta$ , if the firm is not liquidated.

## Model Solution: Optimal Exercise Policy

- The option to terminate contract is only available conditional on default, i.e., with  $C_1^L$  and  $V_1^H$ .
- The counterparty (bank) terminates the derivative contract at  $t = 1$  if its immediate payoff  $V_1$  is greater than the expected continuation value

$$\begin{aligned}
 V_1^H > & (1 - p_2)(V_1^H + \rho\delta_H + (1 - \rho)\delta_L + \theta) \\
 & + p_2\rho(V_1^H + \delta_L + \theta) \\
 & + p_2(1 - \rho)(V_1^H + \delta_H)(1 - \alpha)
 \end{aligned}$$

$$V_1^H > \frac{\theta(1 - p_2 + \rho p_2)}{\alpha p_2(1 - \rho)} - \delta_H = V^*$$

# Ex-Post Effects of Derivative Terminations

## Proposition

Suppose  $V_1^H > V^*$ . Then derivative terminations result in:

1. The ex post change in the value of debt of

$$\begin{aligned}\Delta D = & -p_2\rho(D_1 + D_2 + V_1^H - C_1^L - C_2^L) + p_2(1 - \rho)(1 - \alpha)\delta_H \\ & -\alpha p_2\rho(C_1^L + C_2^L - V_1^H),\end{aligned}$$

2. The ex post change in the value of equity of

$$\Delta E = p_2(\rho(D_1 + D_2 + V_1^H - C_1^L - C_2^L) - (1 - \rho)\delta_H),$$

3. The ex post change in the value of firm of

$$\Delta V = \Delta E + \Delta D = -\alpha p_2(\rho(C_1^L + C_2^L - V_1^H) + (1 - \rho)\delta_H) < 0.$$



# Firm's Incentive to Hedge

## Corrolary

1. *With the termination right, the firm's expected benefits of hedging are non-monotonic in  $\alpha$ .*
  2. *The termination right reduces a firm's ex ante incentive to hedge.*
- The intuition is that an increase in bankruptcy costs can lead to a higher probability of exercising the termination right and becoming unhedged.

# Reasons for the Termination Rights

- Popular references to systemic risk and regulators objectives.
- Role of ISDA as a private corporation.
- Exentions which can rationalize early termination within a model.

# Extensions

- **Multiple Counterparties**

- Collateral
- When there are multiple counterparties, there may be incentives to “run” to terminate **Multiple**

- **Lenders are Affiliated with Counterparties**

- Lenders partly internalize higher probability of liquidation, may exercise less **Lender Counterparties**

- **Adverse Selection with Firms of Different Risk**

- Safer firms may reject hedging because riskier firms make the contract more expensive. The problem is mitigated by the termination right. **Adverse Selection**

# Sample and Data

- **Detailed Sample of Commodity Producers/Airlines**
  - Collect events of default and hedging data for oil and gas producers, coal producers, and airlines for the period 1996-2021
  - Main benefits: (i) can quantify hedging (hedge ratios, maturity) (ii) can better identify derivative termination events
- **Broad SEC/Compustat Sample**
  - For derivative terminations, we parse 10-Ks for any keywords ('cancel', 'terminat', 'liquidat', 'unwound'), any keywords pointing to the nature of the contract ('deriv', 'hedg', 'swap', 'position') and any keywords pointing to the reason for termination or a governing document ('event of default', 'master agreement', 'master contract', 'ISDA', 'hedging agreement').
  - Events of default keywords ('default', 'event of default', 'bankrupt', 'defaulted', 'bankruptcy')
  - Hedging is measured by a dummy of gains and losses
  - Hedging keywords ('collar', 'derivative', 'hedg', 'risk management', 'forwards', 'forward contract', 'swap').

## Summary Statistics: Detailed Sample

<i>Detailed Sample</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>
Commodity hedger	3,399	0.592	0.492
Hedge ratio, %	3,399	31.2	42.7
Hedge maturity, months	3,430	15.3	18.4
Event of default	3,433	0.031	0.173
High-cost bankruptcy (free fall)	3,433	0.017	0.128
Low-cost bankruptcy (prepackaged)	3,433	0.014	0.119
Hedge ratio based on supply agreements	225	73.5	35.2

<i>Detailed Sample: Bankruptcies</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>
Hedge ratio, %	121	41.9	47.8
Hedge maturity (months)	121	18.2	16.3
May be required to post collateral	105	0.181	0.387
Number of counterparties	70	3	4
Counterparties are lenders	88	0.566	0.460
Derivative fair value, \$M	121	44.5	182.2
Negative derivative fair value	121	0.240	0.429
Positive derivative fair value	121	0.537	0.501
Derivative terminations	97	0.598	0.493

# Exercise Strategy of Contract Termination Rights

- How does exercise vary conditional on different events of default, firm performance (ROA), and collateral (asset tangibility)?
  - Consider three types of events of default: bankruptcy, credit downgrade, accounting restatement

# Exercise Strategy of Contract Termination Rights

<i>Dependent Variable:</i>	<i>Derivative Terminations, %</i>			
Bankruptcy	5.308*** [4.49]	5.255*** [4.39]		
Credit downgrade	0.786*** [2.73]	0.784*** [2.63]		
Accounting restatement (fraud-related)	1.141** [2.09]	1.187** [2.13]		
Default-related words frequency			2.721*** [4.59]	2.604*** [4.37]
Firm size	0.130*** [4.56]	0.173*** [4.89]	0.171*** [3.91]	0.183*** [4.22]
Market-to-book ratio	0.001 [0.58]	0.000 [0.18]	0.001 [0.53]	-0.002 [-0.68]
Asset tangibility	0.085 [0.59]	0.243 [1.14]	0.140 [0.47]	0.334 [1.06]
Firm ROA	-0.233** [-2.55]	-0.283*** [-2.65]	-0.266** [-1.99]	-0.285** [-2.14]
Book leverage	0.135** [2.35]	0.155** [2.33]	0.110 [1.30]	0.100 [1.14]
Observations	144,850	122,842	105,133	101,908
R-squared	0.123	0.133	0.124	0.138
Firm/Year/Ind×Year FE	Y/Y/N	N/Y/Y	Y/Y/N	N/Y/Y

# Contract Moneyness and Exercise Strategy

- How does exercise strategy vary with the costs of bankruptcy, contract moneyness, lenders as counterparties?
- Use the detailed sample since it allows us to observe moneyness of derivative contracts, also better quality of derivative terminations data



# Contract Moneyness and Exercise Strategy

<i>Dependent Variable:</i>	(1)	(2)	(3)	(4)
	<i>Derivative Terminations</i>			
Derivative fair value (\$000s)	-0.448*** [-2.93]	-0.350*** [-2.91]	-0.587*** [-3.97]	
High-cost bankruptcy (free fall)	0.297*** [3.04]	0.312*** [3.05]	0.231** [2.25]	0.231** [2.25]
Counterparties are lenders		-0.270** [-2.39]		
Negative derivative fair value				0.251** [2.29]
Hedge ratio			0.002* [1.89]	0.001 [1.52]
Observations	96	65	91	91
R-squared	0.166	0.226	0.198	0.195
Industry FE	Y	Y	Y	Y

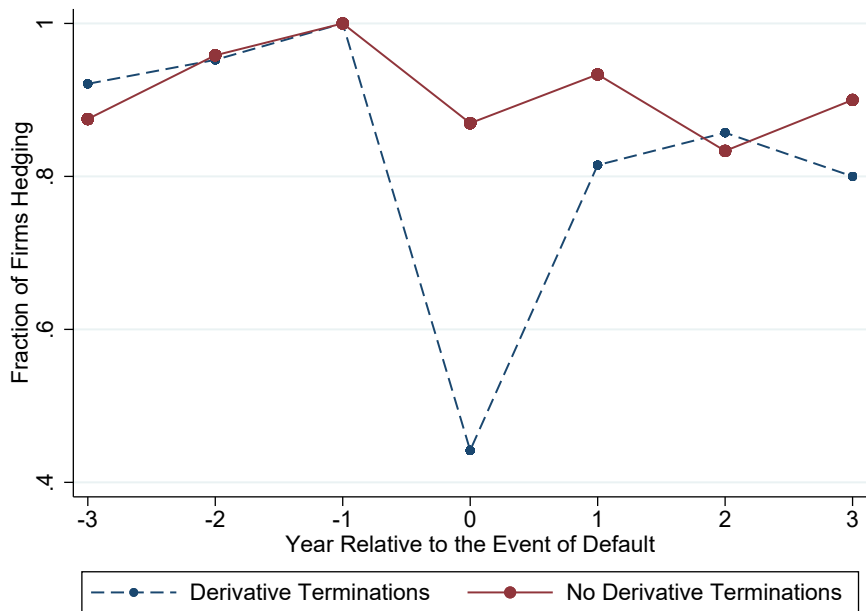
# Effect of Derivative Terminations on Hedging Outcomes

- How does hedging policy change conditional on events of default?
- Are contract exercises responsible for lower hedging of firms in distress?
- Consider placebo tests: coal firms and hedging with exchange-traded futures
- Better identification: *Metavante v. Lehman Brothers* Court Case

# Detailed Sample: Events of Default and Risk Management

<i>Dep. variable:</i>	<i>Hedge Ratio</i>		<i>Hedge Maturity</i>		<i>Commodity Hedger</i>	
Bankruptcy	-18.83*** [-3.42]		-0.62*** [-3.42]		-0.19*** [-3.38]	
High-cost bankruptcy		-23.55*** [-2.72]		-0.80*** [-3.05]		-0.25*** [-2.89]
Low-cost bankruptcy		-13.71** [-2.14]		-0.42* [-1.81]		-0.13* [-1.89]
Observations	3,298	3,298	3,330	3,330	3,298	3,298
R-squared	0.537	0.538	0.750	0.750	0.715	0.715
Year FE	Y	Y	Y	Y	Y	Y
Ind×Year FE	Y	Y	Y	Y	Y	Y

# Do Terminations Explain Low Hedging in Distress?



# Do Terminations Explain Low Hedging in Distress?

<i>Dependent Variable:</i>	<i>Hedge Ratio</i>	<i>Hedge Maturity</i>	<i>Commodity Hedger</i>
Bankruptcy with derivative terminations	-38.66*** [-4.59]	-1.52*** [-5.27]	-0.53*** [-6.26]
Bankruptcy without derivative terminations	-11.59** [-2.04]	-0.23 [-0.78]	-0.05 [-0.44]
Observations	3,204	3,236	3,204
R-squared	0.545	0.757	0.723
t-stat	-2.66***	-3.99***	-4.86***
Controls	Y	Y	Y
Firm FE	Y	Y	Y
Industry×Year FE	Y	Y	Y

## Form of Hedging May Matter

- If a firm hedges not with OTC derivatives, but with physical delivery contracts (also called supply agreements), the option to terminate upon an event of default does not apply.
  - Firm default is non-event. But, in case firm fails to deliver according to contract, there are penalties and other conditions.
  - Almeida, Hankins, and Williams (2021) show that hedging with purchase obligations does not subside as much in distress (attribute to greater pledgeability)

# Placebo Test: Hedging with Derivatives vs. Supply Agreements in Coal Industry

<i>Dep. variable:</i>	(1) <i>Hedge Ratio</i>	(2) <i>Hedge Maturity</i>	(3) <i>Commodity Hedger</i>	(4) <i>Hedge Ratio</i>	(5) <i>Hedge Maturity</i>	(6) <i>Commodity Hedger</i>
Default with deriv. termin.	-33.65*** [-11.44]	-1.48*** [-5.39]	-0.49*** [-6.87]	1.66 [0.72]	0.09 [0.64]	-0.01 [-0.29]
Default w/o deriv. termin.	2.93 [0.26]	-0.16 [-0.48]	-0.06 [-0.48]	-15.55 [-1.10]	-0.46 [-0.68]	-0.18 [-1.03]
Observations	209	229	209	217	204	217
R-squared	0.728	0.713	0.748	0.935	0.940	0.953
t-stat	-3.14***	-3.12***	-3.21***	1.20	0.80	0.96
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Hedging type	Diesel Derivatives			Coal Supply Agreements		

# Hedging with Exchange-Traded Futures (No Terminations)

<i>Dependent Variable:</i>	<i>Use of Exchange-Traded Futures</i>			
Bankruptcy	0.044** [2.00]			
Credit downgrade	0.002 [0.27]			
Accounting restatement (fraud)	0.028** [2.35]			
High-cost bankruptcy (free fall)		0.039 [1.35]		
Low-cost bankruptcy (prepack)		0.062** [2.26]		
Default-related words frequency			0.339*** [18.52]	
Event of default with derivative termin.				0.129** [2.11]
Event of default w/o derivative termin.				0.038* [1.74]
Observations	92,588	105,133	105,133	105,133
R-squared	0.619	0.618	0.621	0.618
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes



# Conclusion

- The option to terminate the OTC derivative contract is valuable and explains the observed under-hedging in distressed firms.
  - The exercise probability increases in bankruptcy costs, but decreases in recontracting costs. The ex-ante value of the option increases in basis risk.
  - We document that the termination right is exercised in 59% of default cases.
  - Additional Result. Derivative terminations drive low hedge ratios: rely on Lehman Brothers vs. Metavante court case, which resulted in a larger number of early contract terminations of NY-based firms post the ruling.

# Oil Price Movements Before Bankruptcy and Effect of Bankruptcy on Hedging

<i>Dependent Variable:</i>	(1) <i>Hedge Ratio</i>	(2) <i>Hedge Maturity</i>	(3) <i>Commodity Hedger</i>
Bankruptcy $\times$ Positive 1-month oil return	-39.852*** [-3.96]	-0.927*** [-3.59]	-0.295*** [-3.92]
Bankruptcy $\times$ Negative 1-month oil return	-8.750 [-0.82] [-0.73]	-0.251 [-0.71] [2.64]	-0.065 [-0.69] [3.15]
Observations	2,584	2,598	2,584
R-squared	0.520	0.747	0.718
t-stat for (a) – (b)	-2.15**	-1.54	-1.91*

## Better Identification: Metavante v. Lehman Brothers Court Case

- To identify exogenous variation in derivative terminations, we rely on the Bench Ruling issued by the U.S. Bankruptcy Court in New York on September 15, 2009.
- Metavante entered into an interest rate swap with LBSF in 2007. In October 2008, LBSF has filed for Chapter 11, which qualified as an event of default.
- Metavante did not terminate the swap and did not make the next 3 quarterly payments it owed to LBSF under the interest rate swap contract.
- US Bankruptcy Court in NY ruled that a party to a swap agreement could not withhold payments otherwise due to the bankrupt counterparty. Further, a party to an ISDA Master Agreement waives its right to terminate the agreement if it fails to do it “promptly” following the event of default.
- As a summary, we find that Metavante case outcome significantly increased the option exercise probability and

## Lenders as Counterparties

- Lenders may require that the firm hedges with the lender's specialized derivatives desk or with the lender's affiliates.

### Proposition

*If the counterparty holds fraction  $\kappa$  of the firm's debt claim, then:*

1. *The termination right is exercised if*

$$V_1^H > V^* + \frac{\kappa(-\Delta D)}{\alpha p_2(1-\rho)},$$

2. *If, in addition,  $\Delta D$  is negative, then there exists a minimum stake  $\kappa^*$  in the debt claim, which, when bundled with the counterparty's claim, guarantees that the right is optimally abandoned.*

## Multiple Counterparties

- Firms can have multiple/heterogeneous derivative counterparties
- Consider sequential-move and simultaneous move games.
- In sequential game, the exercise of the first counterparty lowers the threshold for exercise by the second counterparty.

Suppose B would not exercise the right had it owned the entire portfolio,

$$V^*(\theta_B) > V_1^H > V^*(\theta_A), \quad (1)$$

### Proposition

Counterparty B exercises its termination right if  $V_1^H > \widehat{V}(\theta_B)$ , where

$$\widehat{V}(\theta_B) \equiv \frac{(1 - p_2)\theta_B}{\alpha p_2(1 - \rho)} - \delta_H < V^*(\theta_B). \quad (2)$$

# Adverse Selection

- Firm risk may be unknown and the counterparty offers an average derivative price, which may not sustain pulling equilibria
- There are two types of firms: low-bankruptcy-cost firms,  $\alpha = \underline{\alpha}$ , and high-bankruptcy-cost firms,  $\alpha = \bar{\alpha}$ . Firm type is private information at date 0 and becomes public at date 1. The bank assigns equal prior probabilities to both firm types.

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